

2016

## A Pilot Study of High-Stakes Decision-Making for Crisis Leadership

Terry Lynn Oroszi  
*Wright State University*

Follow this and additional works at: [https://corescholar.libraries.wright.edu/etd\\_all](https://corescholar.libraries.wright.edu/etd_all)



Part of the [Educational Leadership Commons](#)

---

### Repository Citation

Oroszi, Terry Lynn, "A Pilot Study of High-Stakes Decision-Making for Crisis Leadership" (2016). *Browse all Theses and Dissertations*. 2050.

[https://corescholar.libraries.wright.edu/etd\\_all/2050](https://corescholar.libraries.wright.edu/etd_all/2050)

This Dissertation is brought to you for free and open access by the Theses and Dissertations at CORE Scholar. It has been accepted for inclusion in Browse all Theses and Dissertations by an authorized administrator of CORE Scholar. For more information, please contact [library-corescholar@wright.edu](mailto:library-corescholar@wright.edu).

A PILOT STUDY OF HIGH-STAKES  
DECISION-MAKING FOR CRISIS LEADERSHIP

A dissertation submitted in partial fulfillment  
of the requirements for the degree of  
Doctor of Education

By

TERRY OROSZI  
M.S., Wright State University, 2016

---

2016

Wright State University

© COPYRIGHT BY

TERRY OROSI

2016

WRIGHT STATE UNIVERSITY  
GRADUATE SCHOOL

May 23, 2016

I HEARBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER MY SUPERVISION BY Terry Oroszi ENTITLED A Pilot Study of High-Stakes Decision-Making for Crisis Leadership BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF Doctor of Education.

---

Jill Lindsey, Ph.D.  
Dissertation Chair

---

Suzanne Franco, Ph.D.  
Ed.D. Program Director

---

Carol Patitu, Ph.D.  
Chair, Department of Leadership Studies

Committee on Final Examination:

---

Jill Lindsey, Ph.D.

---

Norma Adragna, Ph.D.

---

R. William Ayres, Ph.D.

---

Larry James, Ph.D.

---

Robert E.W. Fyffe, Ph.D.  
Vice President for Research and  
Dean, Graduate School

## ABSTRACT

Oroszi, Terry, Ed.D, Organizational Studies Ed.D. program; Wright State University; 2016. A Pilot Study of High-Stakes Decision-Making for Crisis Leadership

High-stakes decision-making represents a critical component of crisis leadership. This study examined the decision-making processes practiced by global, national, and local crisis leaders to identify common decision-making process traits and propose a useful model to guide crisis leaders' high-stakes decision-making. This research suggested the hypothesis is correct and inexperienced crisis leaders may benefit from a potential new decision-making model better aligned with the experiences of a panel of national and global crisis decision-making experts. Crises have distinct factors: they are time sensitive, pose significant risks, and require consequential decisions. A sample group of fifteen national and international expert crisis leaders from national security, law enforcement, and government sectors was selected for participation in this study. Seven popular decision-making models were deconstructed into individual process traits and turned in a survey. The experts were asked to identify process traits from the survey that they felt best reflected their approach to decision-making. The results were analyzed and a new model assembled based on their expertise. These findings identified a pattern of practice across the spectrum of crisis leaders and demonstrate the usefulness of a new decision-making model that captures the decision-making process traits of expert crisis leaders. This research suggests the hypothesis is correct and will provide inexperienced

crisis leaders a potential new decision-making model drawn from the experiences of a panel of global crisis decision-making experts.

## TABLE OF CONTENTS

ABSTRACT.....	iv
LIST OF FIGURES .....	xvi
LIST OF TABLES .....	xvii
ACKNOWLEDGMENT.....	xi
DEDICATION.....	xiii
CHAPTER ONE.....	1
INTRODUCTION .....	1
Crisis .....	1
Leadership.....	2
Overview of Context and Method of the Study .....	4
Significance of the Study .....	5
CHAPTER TWO .....	6
REVIEW OF THE LITERATURE .....	6
Crisis Leadership .....	7
Contextual Factors Influencing Crisis Leaders and High-Stakes Decision-Making .....	8

Extreme Insecurity .....	8
Vulnerability .....	9
High costs.....	9
Public/Victims.....	9
Greater unknowns and evolving outcomes .....	11
Evolving outcomes.....	11
Enemies.....	12
Media .....	13
Transparency.....	13
Politics.....	15
Stakeholders.....	15
Biases .....	16
Decision-making Models .....	17
Naturalistic Decision-making Model .....	21
Political Model.....	23
Rational Model.....	26
Multi-Attribute Utility Analysis Model .....	28



Nominal Group Model .....	29
Delphi Model .....	31
The Black Model.....	32
Summary of Literature Review .....	33
CHAPTER THREE .....	35
METHODOLOGY .....	35
Purpose.....	35
Identification of Target Population.....	36
Definitions .....	36
Trustworthiness of information. ....	36
Internal validity.....	36
Objectivity and reliability .....	37
Researcher bias.....	37
Sample size and selection. ....	38
Instrumentation .....	38
Survey development .....	39
CHAPTER FOUR.....	46

RESULTS .....	46
Frequency Testing.....	47
Distribution of Shared Process traits.....	47
Shared Decision-Making Processes .....	48
Summary of Results: Frequency Testing.....	50
Correlation Testing .....	59
Shared Decision-Making Processes.....	59
Bivariate analysis and Pearson correlation.....	59
Dimension reduction factor analysis .....	59
PCA correlations.....	60
Validation of Data. ....	63
Kaiser-Meyer-Olkin measure of sampling adequacy .....	63
Bartlett's test of sphericity.....	64
Principal Component Analysis.....	64
Factor Matrix for PCA.....	65
The component plot in rotated space.....	65
Non Parametric Tests.....	65

Summary of Results: Correlations Testing .....	66
The New Decision-Making Model .....	66
Situational awareness. ....	67
Group dynamics.....	67
Decision-making actions .....	68
NDM vs. The New Model .....	68
CHAPTER FIVE .....	89
DISCUSSION.....	89
Discussion of Findings.....	92
Summary.....	110
References.....	112
APPENDIX A.....	129
SYSTEMATIC REVIEW PROCESS.....	129
APPENDIX B .....	142
QUESTIONNAIRE PACKET.....	142
APPENDIX C .....	151
IRB PETITION APPROVAL LETTER.....	151

APPENDIX D.....	153
IRB PETITION.....	153
APPENDIX E.....	171
CURRICULUM VITAE.....	171

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
Figure 1. Crisis Decision Survey .....	45
Figure 2. Traits and Constructs in Qualtrics .....	52
Figure 3. Choice Elimination Theoretical Framework .....	58
Figure 4 Eigenvalues.....	77
Figure 5 Factor Matrix for PCA.....	79
Figure 6. Component Plot in Rotated Space.....	81
Figure 7 Venn diagram of the new decision-making model.....	84
Figure 8 Venn Diagram of the New Crisis Decision-Making Model and Contextual Factors.....	86
Figure 9 Multiple Options New Model in Action.....	102
Figure 10 Values Assigned, New Model in Action .....	104
Figure 11. Rank Ordering, The New Model in Use.....	106
Figure 12. Plot Outcome, the New Model in Use.....	108

## LIST OF TABLES

Table	Page
Table 1 Group Decision Models and Associated Traits .....	43
Table 2 Response Frequencies.....	54
Table 3 Top Shared Traits and Associated Models .....	55
Table 4 Group Decision - Making Models Traits with Associated Question.....	56
Table 5 Questionnaire Results From 15 Responders .....	69
Table 6 PCA/Pearson Correlation.....	73
Table 7 KMO and Bartlett's Test .....	74
Table 8 <i>Coefficients for the Highly Correlated Process Traits</i> .....	75
Table 9 A New Decision-making Model .....	82
Table 10 NDM's Contribution to the New Decision-Making Model .....	87
Table 11 NDM Model's Process Traits That Did Not Make the Cut .....	88
Table 12 Systematic Literature Review .....	133
Table 13 Authors from Literature Review Appearing Multiple Times .....	134

## ACKNOWLEDGMENT

I would like to acknowledge Dr. Jill Lindsey, my dissertation advisor, role model and mentor. There was not a person out there more suitable to guide me along this path. I remember the day I came to this realization watching her speaking to faculty and students it what could be deemed a crisis situation, and she handled it brilliantly. My committee each had a role in my development, as well as my dissertation's progress. Dr. Norma Adragna is an example of humility and kindness. She has known me for several years as interim Chairperson and professor in the department of Pharmacology and Toxicology. Dr. Adragna undertook the dissertation with the scrutiny of an accomplished scientist while offering encouragement and support. Dr. R. William Ayres had the political experience, as well as an understanding of the subject and offered the greatest insight and without him the final product would not be close to what it is. He tore it down and rebuilt it, better...stronger. Dr. Larry James, his expertise in psychology and terrorism gave this project the gravitas required, while offering up advice and support. If I were to do it over I would not change a thing. This accomplishment belongs to all of us.

Dr. Cathy Graham acknowledged me in her dissertation for the support I gave her. The assistance I provided to her was nothing compared to what she did for me just two years later. From proofing papers to offering a shoulder, between Cathy and Scott Graham I felt "covered" at all times, thank you both. Dr. Jeffery Travers, the P&T faculty staff and students all deserve my recognition and thanks. Drs. Nephthalim

Greene, Rosalyn Scott, and James T. Hardy at the Dayton VA medical center, along with my VA colleagues, opened my eyes to a new world. I am forever grateful.



## DEDICATION

Nothing happens in isolation, this is dedicated to the people that kept me going. My family and children, Adam and Dominique, my friends and colleagues. Without the collective group this would not have happened. The progression through a doctorate involves a roller-coaster of emotions: panic, fear, elation, joy, and at times I experienced all of them in one day. The true test of this accomplishment is not the degree, but the evolution of the person throughout the process. Thank you everyone involved.

## **CHAPTER ONE**

### **INTRODUCTION**

High-stakes crisis leaders must take into account factors that other decision-makers may not address. To address these factors requires multiple decision strategies. This study examined the decision-making processes practiced by global, national, and local crisis leaders to identify common decision-making process traits and propose a useful model to guide crisis leaders' high-stakes decision-making. By analyzing the process of high-stakes decision-making other crisis leaders may gain a more informed understanding of decision-making for crisis leadership. This research suggested that no current decision-making model adequately captures the process of high-stakes decision-making by crisis leaders. A new model is proposed based on the processes used by current crisis leaders.

#### **Crisis**

The current literature provides no universally accepted definition of crisis. The definitions of crisis are highly diversified depending on the field of the researcher (Pauchant & Mitroff, 1992). The literature includes many synonyms for crisis, such as disaster or catastrophe, increasing the difficulty in identifying a consensus definition. Crises are defined in this research by Pauchant and Douville (1993) as “disruptive situations that require urgency, involve novel decisions and require immediate and decisive action.” This is the basic definition of crisis used in this study.

Crisis events are divided into acute crises or chronic/long term crises. The acute crises will be the focus of this research. Acute crises are time sensitive and require immediate action. The acute crisis is one in which a triggering event spawns a crisis; this can be a shortage of resources, injured victims, and/or damaged properties. One example of an acute crisis involving a thinking enemy would be an active shooter. A non-thinking, acute crisis could be a hurricane, tornado, avalanche, or other natural disaster. Chronic or long-term crisis situations are events that have been recognized well in advance or appear over time. This research focuses on acute crisis events and the decision-making process during an acute crisis.

## **Leadership**

Leadership is defined by Northouse (2015) as a process whereby an individual influences others to achieve their goal. Grint (2005) prefers to look at leadership through the lenses of the leader. It is who they are, what they achieve, where they do it, and how they get it done. He goes on to further define leadership as a process, by which the leaders learn to lead. For this study we are interested in how the positional leader learns to lead when in a crisis role and the factors that affect the leader's decision-making. Crisis decision-making leaders "get it done" and how they do this was explored in this study.

Crisis leaders do not make decisions in isolation. There are several factors that influence the decision-making process. The complexities involved in crisis decision-

making are unique. These added pressures require a working knowledge of the factors that frame high-stakes decisions.

High-stakes decisions are a critical component of crisis leadership. Studying the process by which leaders go about making high-stakes decisions can provide an understanding of crisis leadership and reveal ways such decision-making can be improved. Crises have distinct characteristics: they are time sensitive, pose significant risks, and require consequential decisions. Trying to apply conventional solutions to an abnormal situation may aggravate, rather than alleviate the problem. Frequently the information is disseminated during an acute crisis event with intelligence gaps, incomplete and conflicting reports. Highly charged crisis situations exert emotional and psychological pressure on decision-makers (Mishra, 1996). The literature reviewed for this study expounded upon the factors that are unique to crisis decision-making.

Not all leaders have the experience or tools to respond decisively to an acute crisis. They are presented with a scenario and expected to respond appropriately, as well as understand the complexities of contributing factors. Failure to respond or poor decision-making in these situations could lead to loss of life or even war in some cases. However, high-level professionals (professionals with greater than ten years in the crisis field and at the level of director/manager/or equivalent) proficient in high-stakes/crisis decision-making can provide an understanding of how to best respond during a crisis. Due to their level of responsibility and experience in high-stakes decision-making, they

have developed successful strategies and have been exposed to unsuccessful strategies. The rationale of this research is to offer a structured approach for leaders who encounter crises which demand executive action and high-stakes decision-making. This study asserts that decision-making for high-stakes or crisis leaders is unlike the decision-making for any other group of leader. A systematic literature makes this case in Chapter 2 (see Appendix A) and presents seven well-established decision-making models that serve as the basis for the hypothesis that a new crisis decision-making model is needed. Chapters 3 and 4 present the methodology and results from this study examining the decision-making processes practices by global, national, and local crisis leaders and proposes a useful new model to guide crisis leaders' high-stakes decision-making.

### **Overview of Context and Method of the Study**

There are two categories of decision-making models, rational, and intuitive (Elbanna, 2006; Sayegh, Anthony, & Perrewe, 2004; Sinclair & Ashkanasy, 2005). Rational models are used most frequently in strategic decision-making (Elbanna & Child, 2007). This category of models is considered logical and involves a series of sequenced steps to work through the decision-making process. Rational decision models are based on assumptions as well as facts. Intuitive models, by contrast, do not depend on reason or logic, but draw on intuition and experience. One particular model of interest is a combination of the rational and intuitive approaches. Three popular models from each of the two categories, and one blended model were deconstructed into individual process

traits. The process traits from all seven models were compiled into a list for a survey completed by crisis experts. The results were analyzed, and a new model emerged based on crisis leaders' expertise.

### **Significance of the Study**

Crisis leaders with experience in the fields of terrorism, weapons of mass destruction, first response, active threat, politics, military, medicine and emergency management can contribute to the development of the decision-making model to support crisis leadership, and especially guide less experienced crisis leaders. When faced with a crisis, community leaders, or other non-crisis experts may need to rise to the challenge of crisis decision-making without prior experience, training or expertise. The results of this study provide these leaders with a model to make high-stakes decisions in times of acute crisis.

## **CHAPTER TWO**

### **REVIEW OF THE LITERATURE**

The purpose of this study was to examine the decision-making processes practiced by global, national, and local crisis leaders to identify common decision-making process traits and propose a useful model to guide crisis leaders' high-stakes decision-making. One assertion made in this study is that high-stakes crisis decision-making differs from other forms of decision-making. This literature review presents evidence that crisis decision-making differs from other decision-making because of factors that influence the decision process. In addition, this review describes the seven most frequently cited and well-known decision-making models presently used to guide decision-making. These models were examined and deconstructed to identify the process traits that make up each of the seven models. This deconstruction of the models enabled a list of decision-making process traits to be identified as the basis for examining crisis leaders' decision-making processes.

In order to better understand the demands of high-stakes decision-making, this chapter first explains crisis leadership and contextual factors that influence crisis decisions. Then the seven decision-making models are described and an example is provided of how these types of models work.

## **Crisis Leadership**

Crises are operationally defined in this research by Pauchant and Douville (1993) as “disruptive situations that require urgency, involve novel decisions and require immediate and decisive action.” The acute crises will be the focus of this research. Acute crises are time sensitive and require immediate action.

Leadership can be viewed as a person, result, position, and process (Grint, 2005). This definition answers the question what makes a leader by asking who they are, what they achieve, and where they operate, and how they get things done. The leaders in this study were high-stakes crisis leaders with several years of experience and in a role of positional authority. Grint (2005) suggests that leadership is learned best from experience. The leaders who may benefit most from this research are those with positional authority in disruptive situations that require urgency, involve novel decisions and require immediate and decisive action. Disruptive situations and urgency create stress and involve contextual factors that influence the novel decision-making processes and actions a leader considers in a crisis. The complexity of these factors create the high-stakes context and compound the stress experienced by crisis leaders. By definition there is heightened emotional stress associated with the high-stakes decision-making required during an acute crisis (Gheyntanhi et al., 2007; Hart, Rosenthal, & Kouzmin, 1993; Koopman, 1997; Kubany, 1994; Paton, 2006; Smart & Vertinsky, 1977; Suedfeld & Tetlock, 1977). Decision-making outside of acute crisis seldom has far reaching psychological impact on the leader (Hart et al., 1993; Smart & Vertinsky, 1977; Suedfeld



& Tetlock, 1977). Understanding these contextual factors and their role in raising the stakes of decisions informs our understanding of crisis leadership and high-stakes decision-making.

### **Contextual Factors Influencing Crisis Leaders and High-Stakes Decision-Making**

A defining characteristic of crisis leadership is that unique contextual factors put added pressure and stress on the leader. Crisis leaders are constrained and influenced by these factors when making decisions. The potential combination of multiple factors in a crisis increases the high-stakes nature of decision-making characteristics of crisis leadership.

Factors found in the current literature that influence crisis leaders and their decision-making processes include: extreme insecurity and vulnerability; high cost, including loss of life, potential for armed conflict, and victims; greater unknowns and evolving outcomes; enemies; media and transparency; stakeholders, bias, and politics.

***Extreme Insecurity.*** Insecurity has been documented as a factor affecting crisis decision-makers (Benini, 1993; Levy, Hartmann, Li, An, & Asgary, 2007; Perrewé, Halbesleben, & Rosen, 2012). When a crisis leader makes a poor decision, there are multiple ramifications from the loss of lives to losing their job. These threats can impact the decisions made by the crisis leader (Perrewé et al., 2012). Insecurity has prompted crisis decision-makers to look to others to make high-stakes decisions (Levy et al., 2007). One study found when the crisis leader was from a small town they mimicked the decisions made by larger surrounding cities, assuming the spotlight would be on the city

leaders (Levy et al., 2007). The influence of insecurity as a factor affects decision-makers, rather than the process traits in a given decision model.

***Vulnerability.*** The vulnerability factor has two faces: the leader's vulnerability and the vulnerability of the impacted population. One study found when a crisis is international, and the leader believes the power is in the hands of others the decision-maker will focus on domestic issues (Kupchan, 1994). Another study found when a leader feels vulnerable they give in to those with power and agree with decisions to appease others (Hermann & Hagan, 1998). This resulted in increasing vulnerability because others with power became very competitive to keep and even gain more power (Hermann & Hagan, 1998). In a study the risk decision-makers must face during a volcanic crisis, the vulnerability of populations, and the costs of false alarms found to be factors (Sobradelo, Martí, Kilburn, & López, 2015). Vulnerability is another factor that influences models by affecting the decision-maker.

***High costs.*** The possibility of war or loss of life are factors that are unique to crisis decision-making (Gordon & Arian, 2001; Rosenthal & Kouzmin, 1997; Snyder & Diesing, 2015). The mere fact that war is possible adds a layer of complexity unknown to non-crisis leaders (Snyder & Diesing, 2015). Moreover, when decision-making is happening on a global level, the threat of war by one party is often the cause of the crisis. The possibility of loss of lives, especially through war, is a factor that weighs heavily in decision-making.

***Public/Victims.*** Impact on the public and possible victims of crises also plays a crucial role in crisis decision-making (Eisenhardt & Zbaracki, 1992; Knecht &

Weatherford, 2006; Pearson & Clair, 1998; Rosenthal & Kouzmin, 1997). Victim management can be the most volatile of all crisis responses and exemplifies the vulnerabilities in crisis decision-making. While the media may play a part in sensationalizing victims, the success or failure of a crisis event depends heavily on the victims' perspectives. Crisis decision-makers must make victim management a significant factor in negotiation terms or when discussing options. Crisis decision-makers need to pay particular attention to the children and be sensitive to the family and culture requirements in the aftermath of disasters of all kinds (Hendricks & Hendricks, 2014).

High costs related to loss of life and victims contributes or interferes with the decisions by improving situational awareness, allowing crisis leaders to know as much as possible before making a decision. It also affects the decision process, by limiting the possible outcomes. Leaders must also live with a decision that may increase the victim numbers, even at times for the “greater good” such as during wartime when President Truman bombed Hiroshima and Nagasaki to save a half million American soldiers (Bernstein, 1986).

Examples of other costs associated with crisis decisions-making are destruction of land and property on a grand scale (Benini, 1993; Janis & Mann, 1977; Levy et al., 2007; Saad, 2013; Sayegh et al., 2004). Weighing the costs of a decision is an essential risk in decision-making. Weighing the costs of a decision is a necessary risk in decision-making. When decision-makers failed to look at multiple options and instead looked exclusively at a favored choice, they often neglected to examine major costs and risks associated with that preferred choice (Herek, Janis, & Huth, 1987). Ignoring costs

interfered with the decision makers' ability to assess the impact of their decision.

Options related to costs are limiting because the system or decision-maker may be unable to accurately assess and/or pay high costs.

Simulations have assisted in estimating costs without the actual loss of life, or danger to the environment (Benini, 1993; Schofield, 1989). The ability to try out different decision-making strategies through computer simulations started with military games, but has advanced business, medical, and international crises response planning (Schofield, 1989). The State Department's first interest in the use of simulation games came following threats of terror. The terror threat was poorly understood and games of uncertainty better prepared leaders for such crisis situations (Schofield, 1989).

*Greater unknowns and evolving outcomes.* Benini (1993) wrote about the high number of unknowns during a crisis. The impact limited resources and security have on populations during a crisis have rarely been determined at the onset when decision-making was required. The costs cannot be delineated, the victim count may continue to increase, and threats may continue to rise. Unknowns heavily influence decision models and can undermine confident decision-making. Similar in impact to evolving outcomes, the crisis decision maker must continually adapt, having confidence that they are making the best decision in that moment. Crises by definition present greater unknowns requiring adaptation and fluidity in decision-making.

*Evolving outcomes.* Throughout a crisis, outcomes are continually being redefined (Herek et al., 1987; Welch & Helfstein, 2012). When faced with a crisis the outcomes result from the decision-making, implementation and associated factors (Welch

& Helfstein, 2012) Herek et al. (1987) hypothesized that decision-making directly affected the outcome, better decision-making equated to better crisis outcomes.

Outcomes were also determined by the goal of the decision-maker, in that leaders tended to make decisions that better met their aims (Herek et al., 1987). An outcome resulting from crisis decision-making cannot be readily identified until one is engaged in the decision-making process. Because the outcomes of any decision are evolving, adjustments during the decision-making process must be made.

***Enemies.*** Identifying the enemy is a key factor in crisis decision-making. Research suggests that thinking and non-thinking crisis antagonists affect decision-making processes (Sun & Jones, 2012). Knowing who was an enemy and how they operated guided and strengthened decision processes. An option or outcome may work for one type of enemy but not another. Military operations have revealed that the more known about the enemy, the more the enemy influences were able to be mitigated. Knowing the enemy improved leaders' situational awareness (Sun & Jones, 2012).

Over the past twenty to thirty years the face of the most common enemy has changed. Today's most-feared enemy is terrorism, and the faces of terrorism include IS, Al-Qaida, Boko Haram, and Al Shabab. Domestic terrorism is on the rise (Committee on Homeland Security, 2015). The jihadist threat in the U.S is high. U.S. based terror cases have increased more than three-fold in just five years (Committee on Homeland Security, 2015). In the last year, ISIS has inspired or directed fifteen known cases in the United States (Watkins, Yourish, & Giratikanon, 2016) and fifty-seven terror attack plots against Western countries (Committee on Homeland Security, 2015). The influences of the

enemy as a factor is compounded by the way enemies generate other factors. The terrorist enemy has created a sense of extreme insecurity for civilians and soldiers.

**Media.** Most of us experience disasters through mass media (Wei, Zhao, & Liang, 2009). At the start of the event, there are often gaps in knowledge about the crisis. The media, in a rush to share the story will fill the gaps with uncorroborated information. The media will also not hesitate to point out every flaw in the decisions made by crisis leaders. The choices of what information to share, and what to keep away from the public's eye, need to be made by the media-aware decision-makers. If decisions are shared with the public the media will use it to benefit their cause.

Heddleston (2015) pointed out the public were not the only ones who profited from mass media during a crisis. Terror groups, like the Islamic State (IS), have used mass media to showcase their atrocities and to recruit members. There is some evidence that videos portraying victims or jihadists have been particularly powerful in radicalizing individuals (Aly, 2016; Holt, Freilich, Chermak, & McCauley, 2015; James & Oroszi, 2015; Weimann, 2011). The Islamic State has also used the power of displaying victims, especially women or children, to make the public even more afraid. Crisis decision-makers need to recognize the power of the media and attempt to harness it. The media can influence decisions and/or the outcome of decisions.

**Transparency.** Transparency is an influencing factor in crisis decision-making (Allison & Zelikow, 1999; Finel & Lord, 1999; French, Raven, & Cartwright, 1959; Sun & Jones, 2012; Tarar & Leventoglu, 2009). Determining how much information the decision-maker shares with the public must be decided quickly and decisively. The

ramification of sharing too much or not enough is a factor that weighs heavily on the crisis leader (Finel & Lord, 1999). They must identify the amount of transparency a crisis demands and how it will affect the decision (Sun & Jones, 2012). When information is released that an imminent crisis may threaten lives, there is a potential for mass chaos, looting, and mayhem. In the case of natural disasters, a decision-maker must consider the consequences of transparency, not only for property and victims, but infrastructure, stakeholders, and others, such as a city manager, mayor, police, and fire departments. Transparency influences the leader by increasing the awareness of the situation and the decision process.

Transparency can be critical in crisis decision-making. One method to maintain or keep power for the crisis leader is to not share all of the potential outcomes or options during the decision-making process. This lack of transparency will help guarantee the preferred outcome; however, this may lead to others questioning of the motivation of the leader(s). In some crises, it may be advisable to remove transparency and negotiate behind closed doors. When the decision-making option is transparent, the crisis leader may lose the flexibility to negotiate or to reconsider alternative options. Chances for a favorable option are decreased if both options have considerable backing from others (Tarar & Leventoglu, 2009).

When President Kennedy threatened the Soviet Union during the Cuban missile crisis, “remove your missiles or else.” He shared only part of the information with the American public thus gaining support for his decision and allowing the public to increase his “power,” by making the coercive threat stronger (French, Raven, & Cartwright, 1959) thus leading to only two outcomes, comply or go to war. President Kennedy neglected to

share with the public the outcomes included a third option, removal of US missiles from Turkey (Allison & Zelikow, 1999; Tarar & Leventoglu, 2009).

***Politics.*** Politics play a role in crisis decision-making (Bullough, 1987; Mezley, 2004; Singer, 1984; Snyder, 1971). In politics the decision-makers are usually in disagreement because of competition and the dispersal of power amongst the members, outcomes are consequences of a continuous bargaining game (Mezley, 2004). High-stakes negotiations in politics are often unsuccessful because of the distrust and hostility felt between people seen as outsiders (Bullough, 1987). There is an innate fear that if too much is shared, it will be used against them (Singer, 1984). Singer (1984) posited that time was an enemy in crisis decision-making, the more time spent deliberating, the greater the opportunity for trust diminished, and fear or hostility took over. As long as global politicians make decisions based on fear and mistrust, world peace will never be obtainable (Levy et al., 2007). The threat of war increases the vulnerability of the decision-maker and is a factor that may not be controlled by the crisis leader alone. Other political stakeholders, may also have influence over decisions. The processes in decision models are not directly affected by politics; but politics influence decision-makers and consequently their choices.

***Stakeholders.*** A stakeholder is a factor that complicates the crises decision process (Drake & Walters, 2015; Dye, Eggers, & Shapira, 2014; Levy, Hipel, Howard, & Astorino-Courtois, 2009). Crisis complications involve concessions to stakeholders a crisis leader must make to secure the best possible outcome. Crisis leaders are often seeking vital resources during the crisis, and those with control over the resources have control over the decisions being considered (Drake & Walters, 2015; Dye et al., 2014).



The communities and governments affected by the crisis decision are examples of invested stakeholders.

Decision-makers are answerable to many stakeholders with different needs and preferences. Those needs may not be the most socially optimal, and the decision-maker needs to take this into consideration (Dye et al., 2014). On the morning of August 29, 2005, Hurricane Katrina struck the Gulf Coast of the United States. The decision to evacuate a city as big as New Orleans can be cost exorbitant and has been known to cost decision-makers their jobs when the decision to do so was done prematurely and without the ultimate need, but when it was not done soon enough, there were casualties. Crisis decision-making in this context involves multiple stakeholders (Levy et al., 2007).

Stakeholders differ from politics due to the constituents involved. Examples of stakeholders include residents, local business or landowners or nonprofit humanitarian groups. There is not necessarily conflict between these decision-makers, or a fear to share information as seen in the politics factor because they may or may not have a political agenda.

**Biases.** Selective bias is prevalent in the processing of new information by decision-makers (Eckel & Grossman, 2008; Herek et al., 1987; I. L. Janis & Mann, 1977; Vinson, Costanzo, Berger, & Rich, 2009). Bias can influence the decision-making by shaping the options and outcomes. If the decision makers are aware of their biases, the effects can be moderated. Bias also influences group dynamics by allowing a member's opinion to have more weight than another's, affecting decision processes as well as actual outcomes. One study found that decision-makers accepted new information only when it supported their opinion and ignored non-supporting information (I. L. Janis & Mann,

1977). Participants in a crisis may also be fed biased information to control outcomes (Herek et al., 1987). The one consistent finding in crisis and non-crisis decision-making research was that there were always benefits to a heterogeneity of views in the decision process, especially in mitigating bias. However heterogeneity is not a fail-safe. The members at the table are seldom treated equally, and this bias affects the distribution of power and decision-making outcomes. The gender of contributors and the decision-maker are factors in decision processes. Eckel & Grossman (2008) found that women tend to be more risk-averse than men, and this was echoed in their decision-making. They found gender differences in the sensitivity to the risk associated with the perception of the catastrophic potential of nuclear war, technology, radioactive waste, industrial hazards, and environmental degradation. In a study by Vinson et al. (2009) bias related to a host of human attributes - age, gender, education, marital status, occupation, and ethnicity- were found to be predictors of how people weigh in on particular issues. The crisis leader must recognize the influences of their own personal bias as well as biases among contributors in the decision-making process.

Crisis leadership is informed by an understanding of the complexity of interacting contextual factors that raise the stakes of decision-making and influence actions a leader considers in a crisis. Extreme insecurity, high costs, greater unknowns and evolving outcomes, enemies, transparency, and stakeholder politics create the context of each unique crisis and are factors that influence the decision-maker and the process.

### **Decision-making Models**

This section describes seven current decision-making models and the distinctive components, referred to as “process traits”, associated with each model. This study used

identified process traits in existing decision models as the basis for exploring crisis leaders' decision-making practices. Therefore, understanding these various models and their defining process traits was foundational for this study.

In the literature, established decision-making processes are referred to by a variety of terms, e.g., models, methods, or techniques with no clear distinctions in labels. Therefore, for the purpose of this study, all decision-making processes were referred to as models. Decision-making models direct the decision-making process and guide options for choosing a course of action. The models were generally developed by examining how experts made decisions in varying situations (Ramser, 1993). Models are not necessarily linear and they are not always a series of steps one must follow to answer a question. They may be more conceptual, providing a framework for a way of thinking. Some models do follow strict processes and are more analytical, while others determine or guide the process of decision-making.

There are several questions typically asked when determining the model to be used to make decisions. These include: who will make the decisions, how will members contribute, when must the decision be made, and how is the team formed to start the process. Determining the answers to these questions assists from the planning stage of the process through a decision. The purpose of a model for decision-making is to maximize the potential to make the best decision. There are a variety of models for decision-making that can be applied in diverse situations. Some decision-making models are suited to general decision-making, and others are specific to particular types of decisions.

There are two categories of decision-making models, rational, and intuitive (Elbanna, 2006; Sayegh et al., 2004; Sinclair & Ashkanasy, 2005). Rational models are used most frequently in strategic decision-making. This category of model is considered logical and involves a series of steps to work through the decision-making process. Rational decision models are based on assumptions as well as facts. Intuitive models, by contrast, do not depend on reason or logic, but draw on intuition and experience. When a decision involves a complex environment and limited time Dane and Pratt (2007) suggested use of intuition models. Some existing models are combinations of the rational and intuitive approaches.

Rational decision-making models include Decision Matrix analyses, two well-known are the Pugh Matrix and Multi-Attribute Utility Theory (Cervone, 2009). They are complex examples of models where the many options are rated against important criteria and decisions are made by weighing the different options. For this research the Multi-Attribute Utility Analysis decision tree was examined. This model was chosen because it is referenced in crisis decision-making literature and has been compared to the Naturalistic Decision Model (Klein & Calderwood, 1996). Two other models that fall into this category include the aptly named Rational Model (Simon, 1977), and the Political Model (Pfeffer, 1981; Turpin & Marais, 2006). These two models were chosen because of their association with high stakes decision-making. The Rational models can be time-consuming and often require much groundwork involving information gathering (Janis, 1982). In a crisis time is limited, but when the stakes are high, a balance must be found, or the costs may increase.

Intuition based decision-making models is the second of the decision-making categories discussed for this study. This category of decision-making relies on personal experience and intuition (Eisenhardt & Zbaracki, 1992). For this research, two intuition models were examined, Nominal Group (J. Horton, 1980; M. Horton, Rogers, Austin, & McCormick, 1991) and Delphi (Cantrill, Sibbald, & Buetow, 1996; Fink, Kosecoff, Chassin, & Brook, 1984). The two models were chosen because they are frequently used and closely resemble the methodology used in this study.

A high-use model that was identified in the literature as a blending of the intuition and rational model types is the Naturalistic Decision-making Model (NDM) (Galloway et al., 2012; Klein, G. & Klinger, D., 1991). The NDM has been used in crises when time was limited, all options could not be considered, and the expert had to make the decision based on intuition and expertise (Klein, G. & Klinger, D., 1991; G. Klein & Calderwood, 1991). This model was developed using site responders on the ground acting and reacting, rather than managerial decision-makers.

The models selected for this research were chosen based on their frequency reported in current literature, diversity of models, and their connection with crisis decision-making. Careful attention was paid to include samples from the two broad categories as well as a blended model, the one most often used on the ground in crisis response, the Naturalistic Decision-making Model. When choosing the seven models diversity in types was an important consideration. Models were selected that allowed for group discussion or silent voting, gave weight to options or outcomes, and that allowed for distance voting to ensure diverse representation in the selection process.

**Process Traits and Contextual Factors.** Process traits are defined in this study as traits that relate to the different decision-making models as defined by their authors. The traits were gleaned from the authors that defined the models, when possible, via published papers, or by authors that use or research the models. Contextual Factors were defined for this work as factors that influence crisis decisions. In this section, examples of the process traits and influencing factors are presented in discussion of each of the seven models. Not all of the process traits identified work well in a crisis, but they were still included.

### **Naturalistic Decision-making Model**

The model of group decision-making that closely mimics a high-stakes decision-making is the Naturalistic Decision-making (NDM) model (Schaafstal, Johnston, & Oser, 2001). This model uses experience and instinct to make effective decisions without analyzing alternatives and is used in real world environments where time is critical (Klein, 2008; Turpin & Marais, 2006). Development of the NDM model for decision-making included observation of decision-makers such as firefighters, emergency room personnel, and urban foreground commanders, as they handled non-routine events (Klein, G. & Klinger, D., 1991). The NDM is a checklist of considerations for decision-makers. The example of a Fire Chief responding to a fire helps illustrate how this model works. The model's process traits are highlighted in italics and guide the decision-maker through attending to relevant influencing factors to be considered.

**Case 1 NDM:** Decision Maker: Fire Chief; Decision: Respond to a fire; Enemy: Fire.

**NDM process traits.** *The goals are undefined.* Other than to minimize the loss of life and property the goals are undefined. The goal may be to let the fire burn itself out, or to send the firefighters in to put out the fire. *Needed information is missing.* The Fire Chief does not have the complete information to make the decision, examples of incomplete information include: the building may have flammable materials inside that can increase the fire temperature or the winds may shift. *Conditions continue to change.* The potential for the fire to flow in different directions, other structures may be affected. *Decision-making happens in a high-stress environment.* The decision-making in a crisis situation, such as a fire, can cause stress to the decision-maker and the potential victims. *Time constraints.* The time to decide to let the fire burn out or send firefighters in to put out the fire is limited. *Experienced decision-makers.* For the NDM Model instinct guides the decision-making process so the chief's previous experience improves the chances of a favorable outcome.

**Recognizing the NDM Contextual Factors.** In spite of the experience of the Fire Chief, there is potential for *extreme insecurity* due to *greater unknowns and evolving outcomes*. There could be other threats such as chemicals housed in the building on fire. The decision could *cost lives and increase the victims*. Loss of life in a fire may include victims in the building or the firemen and *damage to property* may increase the costs. When considering the factors influencing the decision process one must consider the *enemy*, it is the fire, a non-thinking enemy. The *media* could be present and the idea of being on the news impacts the decision-making; the Fire Chief may be less inclined to act or risk lives. The owners of the structure, land or nearby are *stakeholders* to be considered. The Chief has potential for *bias*. The firefighter's demographics may show

bias toward an inexperienced or female firefighter or child victims, allowing personal feelings to steer the chief's decision. If the Fire Chief makes a bad decision he/she has the potential to not get reelected so *politics* may be a factor as well.

The NDM directs the leader to make decisions based on attending to influencing factors as they relate to outcome goals, needed information, changing conditions, stress, and prior experience (G. Klein, 2008; Klein, G. & Klinger, D., 1991).

### **Political Model**

Pfeffer (1992) defines organizational politics as activities that acquire, develop and use power to obtain desired goals when there is uncertainty about choices/outcomes, similar to high-stakes situations. With this in mind, the Political Model was an appropriate model for inclusion in this study. This classic model views group decision-making as a personalized bargaining process. The needs and desires of the members outweigh rationality. This decision-making style is seen as a battle, and the goals are defined by self-interest, not for the good of the department or the organization as a whole. Many decision-makers pretend that power and influence should not or does not exist (Pfeffer, 1992). With this model, the power struggle is acknowledged and considered.

Pfeffer (1981) distinguishes differences between power and authority. He defined a Political Model and speaks about decision models as frameworks and tools to increase the efficiency and effectiveness of the decision-making process. Dr. Pfeffer places great emphasis on the roles conflict and struggle play in the process, and identifies their use as the Political Model. Pfeffer (1981) further delineates the Rational Model from the Political Model by discussing the ends and our outcome. The Political Model includes



disagreement about the ends or at least the ordering of outcomes, whereas the Rational Model involves agreed upon outcomes.

The Political Model asserts that the decision is based on decision makers' personal preferences and choices (Salancik & Pfeffer, 1978). Although the Political and the Rational Models are both examples of the rational model category, Pfeffer (1992) identified several distinctions between the two.

**Case 2 PM:** Decision Maker: President and staff; Decision: War; Enemy: Terror group

**PM process traits.** The process traits of the PM model are founded on research by the authors that outlined the model (G. Klein, 2008; Klein, G. & Klinger, D., 1991). The authors outlined the following process traits: *The goals are defined by self-interest.* The decision-makers have their own personal agenda when making decisions, this can be seen in politics and in other fields. *The needs and desires of the members outweigh rationality.* The decision to go to war is not always based on complete and verified facts. *This decision-making style is seen as a battle.* When decision-makers have different goals the process can inspire conflict and debate, with both sides doing their best to win. *Structure of the organization influences outcome.* The country may have the power to invade, but there are International rules the decision-makers must follow. *Power and Influence weigh heavily on outcome.* The President may get his/her way because their power has more weight than others. *Power is decentralized.* Although the president has more power his/her vote is not alone, there may be several other decision-makers with a vote. *Focus on more than one issue at a time.* When considering war or international conflict there are several issues happening at the same time, and the decision-makers

must respond to several at a time. *Incrementalist Approach*. The decision process using the political model can be a linear or incremental process, weighing outcomes and costs at each step.

**Recognizing the PM Contextual Factors.** *Extreme insecurity and vulnerability*. In a war situation the decision-makers and the public may both exhibit anxiety due to the uncertainty of outcomes, and feel vulnerable due to the unknowns or potential loss of lives, or fear of retaliation. *High cost, including loss of life, potential armed conflict, and victims*. With any type of war or international conflict there is a chance for loss of life, victims, as well as costs to wage war. *Greater unknowns and evolving outcomes*. There are several unknowns when in battle, even in war people do not always trust their allies so not all information is shared. *Enemies*. Knowing about the enemy can increase the chances for the decision to have a positive outcome. *Media and transparency*. The media can expose the errors, fill gaps with unsupported information to get the news out first. This can affect the victims and further increase the uncertainty. *Stakeholders*. With an international terror group scenario the host country has influence on the decision. *Bias*. If the enemy, in this case a terrorist, has different religious or political beliefs the decision-makers may use this information to sway the decision to go to war. *Politics*. There are no guarantees that the decision will benefit the President, and his/her political career hangs on the outcome.

The Political Model guides the leader to making a strategic decision by acknowledging personal agendas, power, conflict and differing views of desired outcomes (Allison & Zelikow, 1999; Eisenhardt & Zbaracki, 1992; Eisenhardt, Kahwajy, & Bourgeois III, 1997; Pfeffer, 1992).

## **Rational Model**

Herbert Simon spent his life studying decision-making. He spoke of the parts of choice, all of the options must be ascertained, as well as the consequences of each. He also believed the efficiency of each outcome must be known, thus giving decision-making a quantitative approach to the art of choosing. He defined this as the Rational Model (H. Simon, 1976). The Rational Model (RM) is based on the consensus belief that humans are rational creatures, and they enter into the decision with known objectives. There are known problems with the model, such as assumptions that are made, are all of the options clearly known, as well as the consequences of implementing each alternative (H. Simon, 1976; H. Simon, 1977; Turpin & Marais, 2006). In a crisis situation, quite often the objectives change, depending on the environment and key players. Humans are making the crisis decisions and they are rational beings. The RM model offers a process for analyzing options to make the optimal decision.

**Case 3 RM:** Decision Maker: Surgeon; Decision: Surgery; Enemy: Injured person

**Applying the RM process traits.** The process traits of the RM model are founded on research by the authors that outlined the model (G. Klein, 2008; Klein, G. & Klingler, D., 1991). Based on the Simon's research the process traits for this model are defined by: *Quantitative approach*. The surgeon will spend time weighing out the options, he/she must justify their decision with patient, family of patients, hospital staff and insurance, this can be done by identifying survival statistics. *All of the decision options are assigned a number based on value*. While there is no evidence that this process is used, a number can be a code, with the associated cost. *Assumes objective*

*data.* A hospital may have data on a type of surgery based off of several like surgeries rendering the decision objective rather than subjective. *A formal process of analysis.* Determining the need for surgery is based off several identified elements. *No time constraints.* Although in many cases time constraints exist for surgery, elective surgeries may not be constrained by time. *Unlimited resources to evaluate each choice.* If the patient has exceptional insurance unlimited time the resources to evaluate (such as additional tests) can be unlimited. *This model also requires complete knowledge of information about alternatives.* An experienced surgeon should have, or have access to complete knowledge.

**Recognizing the RM Contextual Factors.** *Extreme insecurity and vulnerability.*

As in many cases surgery can have unknown outcomes, causing the surgeon, patient, and family to experience feelings of insecurity and vulnerability. *High cost, including loss of life, potential armed conflict, and victims.* The patient may die, the tests or surgery may be expensive and to test every option will also increase costs. *Greater unknowns and evolving outcomes.* While all is done to diminish unknowns and be aware of the outcome no two humans are alike so when surgery starts and as it progresses the outcomes are better defined. *Enemies.* The enemy is the disease or injury. *Media and transparency.* The surgeon must be very transparent about the potential outcomes and associated cost. *Stakeholders.* Family and friends influence decisions. *Bias.* If a surgeon is particularly interested in performing a surgery he or she may influence the decision by sharing their opinion. *Politics.* There are no guarantees that the decision to perform surgery will be the right decision and the surgeon's career or reputation can be damaged.

The Rational Model offers a structured, quantitative process to assess data and make a reasoned decision (H. Simon, 1977; H. A. Simon, 1972).

### **Multi-Attribute Utility Analysis Model**

Multi-Attribute Utility Analysis Model (MAUA) can be used in everyday decisions. This is a tool that will help make decisions that have more than one favorable response/choice/answer. When the attributes are defined, and the criteria that will be used to measure them is identified the results are plotted (Lin, Lee, Chang, & Ting, 2008). The idea behind MAUA is that all of the alternatives are plotted and the “best outcome” is the one that falls within the preferences of the group. MAUA is often found to be cumbersome and time-consuming, and fail to work when there is time pressure and changing conditions (Klein, 1999). MAUA was chosen as a sample model because it was a predecessor to the Naturalistic Decision Model (Klein, 1999).

**Case 4 MAUA:** Decision Maker: Police Captain; Decision: Respond to a hostage;  
Enemy: Hostage taker

**Applying the MAUA process traits.** There are only six process traits derived from the literature: *MAUA is useful for everyday decisions.* Employing a model that can be used for everyday decisions will make the decision-maker more familiar with the process thus increasing his/her experience in the decision process.

*Involves more than one response/choice/option.* When a Police Captain must decide to respond to a hostage attack attempting to identify each possible outcome and plot the options will increase the chances for a better outcome. *The results are plotted, each option is weighed and considered and outcome decision options are based on a plot.*

Police are known to use visual aids in their profession, if time permits plotting and weighing each option may assist the Captain in his decision-making.

**Recognizing the MAUA Contextual Factors.** *High cost, including loss of life, potential armed conflict, and victims.* Sending officers in to a hot zone can cost their lives and the lives of the hostages. *Enemies.* The enemy may be known by the police, but not all of their actions can be predicted, thus increasing *greater unknowns and evolving outcomes.* *Media and transparency.* The Police Chief must decide how much information to share with the media and others. Sharing too much with the public can cost jobs, reputations (*politics*) as well as lives. The media appreciates a good story, and may sensationalize the situation increasing panic, *insecurities* and the feeling of *vulnerability* but all involved. *Stakeholders.* Family and friends of the hostage takers are often part of the negotiation tactics, and the family/friends/media can affect decision options. *Bias.* Much like in the Fire Chief case the Police Chief may consider the experience of the officers, he/she may exhibit bias toward gender of police, hostages, or hostage takers.

Multi-Attribute Utility Analysis Model provides a group decision-making process for plotting and rating each option to identify the decision most favored by the group (G. Klein & Calderwood, 1991; Roth, Field, & Clark, 1994; Sanayei, Mousavi, Abdi, & Mohaghar, 2008).

### **Nominal Group Model**

The Nominal Group Model is a structured orderly procedure set out to obtain qualitative data from an expert target group (Cantrill et al., 1996; Fink et al., 1984). It involves a structured meeting and is concerned with obtaining qualitative data (Fink et

al., 1984). The members write down their opinions and ideas. At the end of the writing phase, they read their statements aloud, without discussion, and the responses are recorded. After recording (in writing), there is a conversation, potential debate, and a silent vote (Delp, P., Thesen, A., Motiwalla, J., & Seshadri, N., 1977; Fink et al., 1984; Van de Ven, Andrew H & Delbecq, 1974). This model removes bias (one of the factors that influence decision-making) while making a high-stakes decision. Some unfortunate attributes of the model include the lack of communication and conflict, eliminating conversations that could be shared. This practice may sound more rational than intuitive; however, the shared responses are feelings and opinions, and the individuals are encouraged to exercise creativity.

**Case 5 NGM:** Decision Maker: Chemical-Biological Response (CBRNe) Lead;  
Decision: White powder found, respond; Enemy: Unknown

**NGM process traits.** The NGM model is composed of eight process traits: *Structured, sitting around a table.* The CBRNe lead will likely call in experts and a structured meeting may ensue. *Writing phase with all the options on paper.* Although this may not be typical it could be a method to eliminate bias and power at the meeting. *Oral phase the sharing of options without discussion.* Sharing, and then a *discussion of the recorded ideas to clarify/evaluate* can also aid in the elimination of bias and power. *Conversation & debate* can inspire debate and conflict, opening up the number of options. *Silent independent voting by individuals.* Can also aid in the elimination of bias and power. *Rank ordering or rating procedure results,* such as what tests to perform to determine if the powder is an explosive or a chemical agent. *The "group decision" is the pooled outcome of individual votes.* When trying to make a group decision it is important

to maintain civility while decision-making, this model offers several processes to aid in civil, non-biased decision-making.

**Recognizing the NGM Contextual Factors.** *Extreme insecurity and vulnerability.* An unknown white powder may elicit fear based on previous acts of terror using similar items. Because it is an unknown powder and unknown enemy there are greater *unknowns and evolving outcomes* and can *increase cost, including loss of life, potential armed conflict, and victims.* *Media and transparency.* The media will understand the fear an unknown white powder can provoke respond. *Stakeholders.* The owner of the dwelling where it was found, as well as anyone in the potential hot zone, will have a stake in the decision. *Bias.* Group decision-making can also add an element of bias to the decision-making if the decision-makers are colleagues, this is diminished due to the model's processes. *Politics.* A crisis like this has the potential to affect the careers of the decision-makers.

The Nominal Group Model offers a structured, step-by-step process for finding group consensus in decision-making (Cantrill et al., 1996; Fink et al., 1984).

### **Delphi Model**

The Delphi Model is a method used for the elicitation of opinions of others and involves the assistance of a questionnaire (Brown, 1968; Fink et al., 1984; J. Horton, 1980; M. Horton et al., 1991). The Delphi Model (DM) does not involve the members sitting around a table as seen with the NGM.

**DM process traits.** *No face to face meetings. Decisions are made by group without contact. Vote is anonymous. Internet is needed. Sequential questionnaires. Multiple rounds, Time consuming. The responses are share with the group prior to next*



*round*. The decision-makers may not be able to all be present; however, in this day and age of online meeting applications, the time and restrictions in communication suggest limited applications for crisis decisions. Sometimes even crisis decisions must be made at a distance, but the Delphi Model is poorly suited to an acute crisis. This model was included in the study because it uses distance decision-making. Intuition permeates all analysis and can be a supplement to quantitative analysis; the Delphi Model is an example of this (Brown, 1968).

**Recognizing the DM Contextual Factors.** This model could be of benefit in more ongoing crises, but not an acute crisis such as the type in this study. The influencing factors cannot be discussed in relation to the process traits of model.

The Delphi Model is a questionnaire-driven long distance model, well-suited to global distribution (Fink et al., 1984; J. Horton, 1980; M. Horton et al., 1991).

### **The Black Model**

The Black Model is the oldest model in this sample group and was chosen due to its simplicity and because it was the only option that allowed voting members to abstain. This model is not as well-known as the others; however it was deemed valuable in this study due to the option to abstain and the ability to dampen the effects of bias.

**BM process traits.** Black (1948) suggested a question answer response model with four processes. *Responses are weighted.* The decision-maker can choose more than one option and give equal weight to each. *Preferred answer(s).* Preferred response would receive a number one; if two answers are preferred each would receive this number. *Public choice theory.* People choose based on personal interest. *Abstain.* Decision-making members have the option to not be part of the decision-making process

while still participating in the discussion. If the member has no opinion on the question, then the group member can abstain, and no points are awarded. In the end, the responses are recorded based on preference (Black, 1948).

### **Recognizing the BM Contextual Factors.**

*Extreme insecurity and vulnerability.* This model allows the member to vote for several choices and will act based on their choice. If this model is used then the *unknowns and evolving outcomes* are less likely. *High cost, including loss of life, potential armed conflict, and victims.* Costs would need to be considered when suggesting outcomes; however, once the options are defined the costs should be part of the option to safeguard successful outcomes. *Media and transparency.* The options are defined prior to a decision so transparency is vital. *Stakeholders.* When considering the decision-makers as stakeholders this model offers a method to give all of the decision-makers a voice. Rather than a yes or no the members can assign a number. The chosen option may have not been the member's first option, but perhaps their second or third, so the members feel as if they contributed more than the yes/no would allow. *Bias and politics.* Both are important when making group decisions. When choosing options in a group other members can bias or create conflict.

The Black Model provides four specific processes for group to assign weight to alternatives and allows members to abstain (Black, 1948).

### **Summary of Literature Review**

The purpose of this study was to examine the decision-making processes practiced by global, national, and local crisis leaders to identify common decision-

making process traits and propose a useful model to guide crisis leaders' high-stakes decision-making. Three areas served as a foundation for this research, crisis leadership, factors influencing crisis decision-making, and decision-making models. This review of the literature demonstrated that crisis decision-making differs from other decision-making because of factors that influence the decision process. Some factors interface with the decision models by influencing the decision-makers awareness of the situation, group (decision-makers) dynamics, or decision processes. Other factors interact with models by influencing the decision-maker. In addition, this review included a description of seven well-known decision-making models and their distinctive process traits, as well as examples of how a crisis leader would use each model and attend to relevant influencing factors in making high-stakes decisions.

## CHAPTER THREE

### METHODOLOGY

#### **Purpose**

The purpose of this study was to examine decision-making processes practiced by global, national, and local crisis leaders to identify common decision-making process traits and propose a useful model to guide crisis leaders' high-stakes decision-making. This study was conducted using a non-experimental relational design to examine patterns in the decision-making processes of a selected sample of crisis leader experts through their responses on a survey instrument. A decision-making survey was sent to a sample of expert crisis leaders to indicate their use of 50 different decision process traits during times of crisis decision-making. Focusing on expert decision makers, rather than less experienced decision makers, has been shown to offer more accuracy when studying complex decision-making (Hammond, McClelland, & Mumpower, 1980).

The study design draws on two consensus models, Delphi, and Nominal Group. The Delphi Model involves the use of a questionnaire (Fink et al., 1984; J. Horton, 1980; M. Horton et al., 1991), and the Nominal Group Model is a structured orderly procedure set out to obtain qualitative data from an expert target group (Cantrill et al., 1996; Fink et al., 1984) Consensus models harness insights from appropriate experts to synthesize information and enable decisions or conclusions to be made with higher degrees of

confidence (Fink et al., 1984). They are structured, systematic, and involve panels of experts as a method to make decisions (Dalkey & Helmer, 1963; Fink et al., 1984).

Survey data were loaded into Qualtrics and SPSS to conduct analyzed using the descriptive statistics of frequency and percentage, the Choice Elimination Theoretical Framework, and Principal Component Analysis (Widaman, 1993).

### **Identification of Target Population**

**Definitions.** In this study, the term *crisis leader* includes individuals who make decisions that could result in the loss of life of others and are in a high-level decision-making position within their organization. Expert was defined to include individuals who have been in their respective field for no less than ten years. The target population for this study were expert crisis leaders who met these criteria. A selected sample population of twenty experts were drawn from the target population and fifteen experts responded.

*Process traits* were defined in this research as a series of traits or characteristics of a model that differentiates one model from another and are demarcated by the authors in current literature.

**Trustworthiness of information.** The researcher applied procedures to control or minimize threats to the validity of the study (Fraenkel & Wallen, 2006). The selection of the sample population, based on expertise as defined above, offered credibility to the data. The data were collected electronically, eliminating researcher influences on the participants.

**Internal validity.** Threats to internal validity were controlled by choosing target members whose positions require a high level of intelligence and discipline expertise to

make high-stakes decisions. There was no loss of subjects and email was used to disperse the survey, so neither mortality nor location threat existed. To increase ecological validity the participants received the survey via email. This allowed the leaders to respond in their natural environment. The threat of instrument decay was diminished by the use of email, which allowed all participants to receive the survey with identical directions on how to proceed. No changes were made to the survey or the instructions during this process (Fraenkel & Wallen, 2006). The researcher collected the data and entered all of the results. To reduce the chance of researcher fatigue the responses from the survey's results were verified on three separate days and times by the researcher. Twenty crisis leaders were selected to participate, five did not respond. Therefore, with a 75% response rate, the responding sample size was fifteen.

**Objectivity and reliability.** Seven well-known and researched decision-making models were deconstructed to generate the survey of fifty decision process traits. The process traits were listed in alphabetical order so the traits of each model would not be grouped in a way that suggested the models, such as a nearest neighbor item being recognized as part of the same model. This strategy decreased the ability of any model being favored over another based on location in the survey. This process ensured an equally objective response to each item.

**Researcher bias.** The researcher was a well-known expert in the field of crisis/terrorism/Weapons of Mass Destruction (WMD) and had professional relationships with several of the expert crisis leaders in the sample. The introduction and instructions for the survey instrument were provided via email and identical for all members of the

group. Following completion and receipt of the survey, a member check by telephone or email was conducted to ensure that participants understood the survey items.

**Sample size and selection.** Twenty crisis experts were identified as a purposive, selected sample through professional affiliations in the global intelligence, government and law enforcement communities. Fifteen of the experts participated (75%) in the study. This expert panel consisted of fifteen senior crisis leaders from five different countries: U.S., U.K., South Africa, Iran, and Turkey. As stated by Fraeklen and Wallen (2006), a population of fifteen individuals can be defended if the group is tightly controlled, but they also suggest future replication of the study should be considered to increase the generalizability due to the sample size and sampling method. The small sample size can lead to confounding factors, allowing an individual's decision-making process to carry more weight and affect the outcome more than in a larger sample size. Another confound related to a small sample size is the effect the sample size has on the statistical analysis. The effect was mediated by confirming assumptions prior to analysis. This research was a preliminary study to test the hypothesis that current decision-making models do not adequately capture the process of high-stakes decision-making by crisis leaders and to identify shared process traits used by crisis leaders in high-stakes decision-making. Future research would include replication or modification with a larger sample to enable the generalizability of the findings.

**Instrumentation.** Survey data were disseminated and collected by email. The survey was sent to each individual with a request that it be completed and returned in one week. This method allowed access to global and national crisis decision-making experts and permitted the experts to respond at their convenience. One of the advantages was the

avoidance of confounding factors inadvertently induced by the personal interaction. One disadvantage to mail surveys was the lack of opportunity for the researcher to clarify instructions. To combat this disadvantage the survey included a list of definitions (Appendix B), and there was an option for a respondent to request clarification if desired prior to completing the survey. No respondent requested clarification. Following completion and receipt of the survey, a member check by telephone or email was conducted to ensure that participants understood the survey items. Performing a member check on the target populations of experts was important to check for accuracy of the responses (Fraenkel & Wallen, 2006).

**Survey development.** Seven decision-making models were chosen from the literature based on their popularity in current literature. Careful attention was paid to include samples from each of the categories as well as a blended model, and the one most often used in crisis decision-making as well as one less suited to crises. When choosing sample models diversity in types was also important. Models that allowed for group discussion versus silent voting, models that gave weight to options or outcomes, and models that allow for distance voting held significance in the selection process. The models were deconstructed into fifty identifiable process traits (see Table 1):

- Naturalistic model, a decision-making model most often identified with crises (G. Klein, 2008; Klein, G. & Klinger, D., 1991).
- Rational Model, an ordered and structured model that believes human beings are rational creatures (H. Simon, 1977; H. A. Simon, 1972).
- Political Model, strategic decision-making, with the understanding that as humans (human nature), personal goals may influence the decision-making



outcome (Allison & Zelikow, 1999; Eisenhardt & Zbaracki, 1992; Eisenhardt, Kahwajy, & Bourgeois III, 1997; Pfeffer, 1992).

- Multi-Attribute Utility Analysis, a model that maps alternatives (G. Klein & Calderwood, 1991; Roth, Field, & Clark, 1994; Sanayei, Mousavi, Abdi, & Mohaghar, 2008)
- Black Model, a model that assigns weight to alternatives and allows members to abstain (Black, 1948).
- Nominal Group Model, a structured, formal consensus model (Cantrill et al., 1996; Fink et al., 1984).
- Delphi Model, a questionnaire-driven long distance model, fit for global distribution (Fink et al., 1984; J. Horton, 1980; M. Horton et al., 1991).

After deconstructing the process traits they were alphabetized to randomize the process traits and remove the possibility of multiple items from a given model being chosen based on proximity on the survey (Schwarz & Oyserman, 2001). The traits were transformed into an Adobe Acrobat survey form by adding radio buttons with options for responding: Y- yes, I use this trait in my decision-making, N- no, I do not use this trait in my decision-making, or U – I am unsure or uncertain if I use this trait (Figure 1), Participants were instructed to select one response for each trait. Following receipt of the survey responses a member check by telephone or email exchanges were conducted asking respondents if they had questions about items or lacked understanding of any item, and whether they wished future information about the study. Respondents did not express any issues with understanding the survey items.

Upon receipt of the completed surveys, the responses were uploaded into Qualtrics to identify frequencies in the commonality of use for each process trait (Qualtrics, 2005; Snow, 2011). This step produced an analysis of the shared decision process traits and what percent of crisis leaders indicated use of each process trait. The output from this analysis provided the data for completing a Choice Elimination Theoretical Framework (Figure 3). This framework was used to conduct a reduction/addition process that classified each of the seven models with the removal or inclusion of each process trait used by 80% or more of the respondents. The final product revealed thirteen common process traits used in decision-making by the sample of crisis leaders. This framework provided a visual display of a step-by-step process to identify shared decision-making process traits.

To identify linear relationships among the crisis leaders constellations of responses, the results of the survey from the fifteen participants were entered into Microsoft Excel and converted from Y/U/N to 1/0/-1. These data were imported into SPSS for Principal Component Analysis (PCA), a variable reduction technique that reduces and identifies correlated information, including the clustering of closely related constellations of variables. This method was used because it is a simple process to correlate observed variables and resembles factor analysis (Widaman, 1993). Through the use of PCA and the Pearson coefficient the shared decision-making processes between the members, sub-groups and the whole group were further examined.

The methodology presented in this study involved a non-experimental relational design that examined survey response patterns in the decision-making processes of crisis

leaders using descriptive statistics, the Choice Elimination Theoretical Framework, and Principal Component Analysis. Finding from these analyses are reported in Chapter Four.

Table 1

*Group Decision - Making Models Traits*

	<u>NDM</u>	<u>PM</u>	<u>RM</u>	<u>MAUA</u>	<u>NGT</u>	<u>DT</u>	<u>BM</u>
1	Undefined goals	Needs of the members outweigh rationality	Quantitative Approach	Useful for everyday decisions	Structured, sitting around a table	No face to face meetings	Weighted Responses
2	Needed information is missing	Goals defined by self interest	Known objectives	More than one response /choice/option	Writing phase, all the options on paper	Decisions made by group without contact	Member has the option to abstain
3	Conditions continue to change	Decision-making is seen as a battle	All options are assigned a number based on value	Results are plotted	Oral phase, sharing options without discussion	Vote is anonymous	Preferred answer or answers
4	Time Constraints	Power and influence weigh heavily on outcome	Assumes objective data	Each option weighed and considered	Discussion of the recorded ideas to clarify/evaluate	Internet needed	Public choice theory, use of economic tools to analyze
5	High stress environment	Focus on more than one issue at a time	Formal process of analysis	Outcome decision based on plot	Conversation & debate	Sequential questionnaires	Point system
6	Multiple people involved	Power is decentralized	No time constraints	Time-consuming	Silent independent voting by individuals	Multiple rounds	
7	Organizational goals exists	Incrementalist approach	Unlimited resources to evaluate each choice		Rank ordering or rating procedure results	Time-consuming	
8	Decision makers are experienced	Structure of organization influences outcome	Requires complete knowledge of information about alternatives		The "group decision" is the pooled outcome of individual votes	The responses are shared with group prior to next round	

*Note.* Seven sample models and their associated traits

**Figure 1. Crisis Decision Survey.** The process traits from Table 1 were arranged in alphabetical order, and a PDF fill-in form was constructed from the table. Each trait listed allowed the participant to have one of the following responses: Y- yes, I use this trait in my decision-making, N- no, I do not use this trait in my decision-making, or U - I am unsure or uncertain if I use this trait.

### CRISIS DECISION-MAKING TRAITS

(Y - yes, I use in my decision making. N - no, I do not use in my decision making, or U - Undecided, I do not know if I use this trait)

Y N U All options are assigned a number based on value	Y N U Organizational goals exists
Y N U Assumes objective data	Y N U Outcome decision based on plot
Y N U Conditions continue to change	Y N U Point system
Y N U Conversation & debate	Y N U Power and influence weigh heavily on outcome
Y N U Decision makers are experienced	Y N U Power is decentralized
Y N U Decision-making is seen as a battle	Y N U Preferred answer or answers
Y N U Decisions made by group without contact	Y N U Public choice theory, use of economic tools to analyze
Y N U Discussion of the recorded ideas to clarify/evaluate	Y N U Quantitative Approach
Y N U Each option weighed and considered	Y N U Rank ordering or rating procedure results
Y N U Focus on more than one issue at a time	Y N U Requires complete knowledge of information about alternatives
Y N U Formal process of analysis	Y N U Results are plotted
Y N U Goals defined by self interest	Y N U Sequential questionnaires
Y N U High stress environment	Y N U Silent independent voting by individuals
Y N U Incrementalist approach, identifies weakness, not new ideas	Y N U Structure of organization influences outcome
Y N U Internet needed	Y N U Structured, sitting around a table
Y N U Known objectives	Y N U The "group decision" is the pooled outcome of individual votes
Y N U Member has the option to abstain	Y N U The responses are shared with group prior to next round
Y N U More than one response/choice/option	Y N U Time Constraints
Y N U Multiple rounds	Y N U Time-consuming
Y N U Multiple people involved	Y N U Undefined goals
Y N U Needed information is missing	Y N U Unlimited resources to evaluate each choice
Y N U Needs of the members outweigh rationality	Y N U Useful for everyday decisions
Y N U No face to face meetings	Y N U Vote is anonymous
Y N U No time constraints	Y N U Weighted Responses
Y N U Oral phase, sharing options without discussion	Y N U Writing phase, all the options on paper

Figure 1. Crisis Decision Survey

## CHAPTER FOUR

### RESULTS

This study sprang from a hypothesis that high-stakes decision-making process traits are not adequately captured by current decision-making models. The hypothesis was confirmed by examining decision-making processes practiced by global, national, and local crisis leaders. Fifteen expert crisis leaders indicated on a 50-item survey the decision-making process traits they used in high-stakes decisions. These data were analyzed using descriptive statistics, the Choice Elimination Theoretical Framework, and Principal Component Analysis (PCA). Findings revealed thirteen common decision process traits drawn from across current decision-making models, indicating the need to articulate a new model for high stakes decision-making that better captures the practice of expert crisis leaders. PCA revealed patterns in shared decision processes among the fifteen crisis leaders. Correlations were found between individuals, sub-groups and the whole group.

Three areas served as a foundation for this research, crisis leadership, factors influencing crisis decision-making, and decision-making models. Crisis leadership, the factors influencing crisis decision-making and decision-making models used in this research were reviewed in detail in Chapter 2. The results of this study are presented in three sections, Frequencies, Principle Component Analysis and Discussion.

## **Frequency Testing**

Responses on the 50-item survey were analyzed using frequencies and percentages.

## **Distribution of Shared Process traits**

The frequency of each trait was determined by importing of the survey results into Qualtrics (Figure 2). Qualtrics (Qualtrics, 2005) is an online survey system that analyzes the respective data once the surveys are returned. The survey process traits (identified as items in the figure) were sorted into three bins; Yes, I use this trait in my decision-making process; No, I do not use this trait in my decision-making process; or Unsure, I am unsure if use this trait in my decision-making process. The Qualtrics output identified frequencies in the commonality of use for each process trait (Table 2).

Results indicated thirteen of the process traits were used by >80% of the selected sample of crisis leaders. The use of eighty percent as a cutoff was determined by generalizing Pareto's distribution and assigning values to the principle, the top 20% has more value than the remaining 80%. Two of the traits were used by 100% of the crisis leaders, "Multiple people involved", and "Conditions continue to change". Two process traits were not used by any of the crisis leaders "No time constraints" and "Unlimited resources to evaluate each choice" (Table 3).

The crisis leaders used process traits from a variety of the models. Five of the seven decision models were represented with traits used by >80% of the sampled crisis leaders (Table 3). The Naturalistic Decision Model (NDM) has five process traits in the top 20%. The Rational Model (RM), Nominal Group Model (NGT), the Political Model (PM) and the Multiattribute Utility Analysis each contributed two process traits. The



Black Model (BM) and the Delphi Model (DT) were not represented as used by >80% of the crisis leaders in this study. The breakdown of questions and their associated models, as seen in Table 4, was an indication that the alphabetizing of all models' process traits during survey development was effective. High use process traits were drawn from across five of the seven models confirming that current high-stakes decision-making models do not adequately capture current crisis decision-making processes. This analysis validated the need for a new crisis decision-making model that better captures expert crisis leaders' decision-making processes.

In table 4 the question and the corresponding trait/model is identified. The (#) represents the survey identifier number. The output from the frequency analysis provided the data for completing a Choice Elimination Theoretical Framework (Figure 3). This framework displays a reduction/addition process resulting in identifying the process traits for a new model.

### **Shared Decision-Making Processes**

The frequencies of common process traits used in high-stakes decision-making provided a framework for a new model for high-stakes decision-making for crisis leadership. The Choice Elimination Theoretical Framework (Figure three) classifies each of the seven models and advances the removal or acceptance of each trait (process traits are identified and numbered in Table 4) down the chart. If 80% or more of the crisis leaders used a trait as part of their decision-making process, it was added. If a trait was used by less than 80%, it was omitted. The process started with the Naturalistic Decision-making Model because of its known use as a crisis decision-making model.

- The Naturalistic Decision-Making (NDM) Model is composed of eight process traits. Of those eight process traits, >80% of the crisis leaders used only five traits. Process traits 1, 2, and 5 were omitted, process traits 3,4,6,7 and 8 formed the foundation for the Framework.
- The Political Model (PM) had eight process traits as well; however, only process traits 5 and 8 were added because >80% of the crisis leaders used these two traits from this model.
- The Rational Model (RM) included two process traits (3, 4) often used by the crisis leaders, and four process traits that were not valuable to their process because >80% of the crisis leaders used only two traits from this model.
- The Multiattribute Utility Analysis (MAUA) had only two process traits (2,5) used by >80% of the crisis leaders.
- The Nominal Group Model (NGT) had only two process traits (5,7) used by >80% of the experts.
- The Delphi Model (DT) had no traits used by >80% of the crisis leaders.
- The Black Model (BM) had no traits used by >80% of the crisis leaders.

The Choice Elimination Theoretical Framework demonstrated a reduction/addition process that classified each of the seven models with the removal of and inclusion of each process trait based on use by >80% of the responding sample of crisis leaders. This process revealed at least 80% of the sampled of crisis leaders used thirteen process traits drawn from across five of the seven current models. These thirteen decision process traits compose a new decision-making model for crisis leadership.

### **Summary of Results: Frequency Testing.**

Descriptive statistics supported the hypothesis that high-stakes decision-making process traits are not adequately captured by current decision-making models. The hypothesis was tested by examining decision-making processes practiced by global, national, and local crisis leaders. The selected sample of crisis leaders' common decision-making process traits were analyzed and revealed thirteen shared process traits drawn from five current models, suggesting the need for a new model that better represent crisis leaders' high-stakes decision-making. The thirteen process traits were then examined to identify how these traits interface with the contextual factors that influence crisis decision-making. The thirteen new traits help the crisis leader attend to environmental cues referred to as situational awareness; influences on the decision-makers or group dynamics, and influences on deciding or actions.

**Figure 2. Process traits and Constructs in Qualtrics.** The frequency of use of process traits was analyzed by importing the completed surveys into Qualtrics. By arranging the constructs into bins and listing the process traits in alphabetical order so the responders were able to sort each trait, irrespective of their parent models, into each bin. The figure illustrates how the constructs (Y/U/N) were represented in bins and the use of the drag and drop method to sort the process traits.

Items	Yes, I use this trait in my decision making process.	No, I DO NOT use this trait in my decision making process.
All options are assigned a number based on value		
Assumes objective data		
Conditions continue to change		
Conversation & debate		
Decision makers are experienced		
Decision-making is seen as a battle		
Decisions made by group without contact		
Discussion of the recorded ideas to clarify/evaluate		
Each option weighed and considered		
Focus on more than one issue at a time		
Formal process of analysis		
Goals defined by self interest		
High stress environment		
Incrementalist approach, identifies weakness, not new ideas		
Internet needed		
Known objectives		
Member has the option to abstain		
More than one response/choice/option		
Multiple rounds		
Multiple people involved		
Needed information is missing		
Needs of the members outweigh rationality		
No face to face meetings		
No time constraints		
Oral phase, sharing options without discussion		
Organizational goals exists		
Outcome decision based		

Figure 2. Traits and Constructs in Qualtrics

Table 2  
*Response Frequencies*

<u>Question</u>		<u># Yes</u>	<u># No</u>	<u>#</u> <u>Unsure</u>
#	<u>Traits</u>			
19	Multiple people involved	15	0	0
46	Conditions continue to change	15	0	0
2	Assumes objective data	13	2	0
17	More than one response/choice/option	13	1	1
25	Organizational goals exists	13	2	0
33	Rank ordering or rating procedure results	13	2	0
38	Structure of organization influences outcome	13	2	0
42	Time constraints	13	2	0
1	All options are assigned a number based on value	12	3	0
3	Conversation & debate	12	3	0
4	Decision makers are experienced	12	3	0
9	Focus on more than one issue at a time	12	3	0
26	Outcome decision based on plot	12	0	3
15	Known objectives	11	4	0
18	Multiple rounds	11	4	0
39	Structured, sitting around a table	11	4	0
41	The responses are shared with group prior to next round	11	3	1
7	Discussion of the recorded ideas to clarify/evaluate	10	5	0
8	Each option weighed and considered	10	5	0
10	Formal process of analysis	10	4	1
14	Internet needed	10	5	0
32	Quantitative Approach	10	5	0
47	Useful for everyday decisions	10	5	0
20	Needed information is missing	9	6	0
34	Requires complete knowledge of information about alternatives	9	6	0
35	Results are plotted	9	6	0
50	Writing phase, all the options on paper	9	5	1
28	Power and influence weigh heavily on outcome	8	7	0

40	The "group decision" is the pooled outcome of individual votes	8	6	1
5	Decision-making is seen as a battle	7	8	0
11	Goals defined by self interest	7	6	2
12	High stress environment	7	8	0
16	Member has the option to abstain	7	6	2
27	Point system	7	7	1
49	Weighted Responses	7	8	0
21	Needs of the members outweigh rationality	6	8	1
29	Power is decentralized	6	8	1
43	Time-consuming	6	9	0
6	Decisions made by group without contact	5	9	1
24	Oral phase, sharing options without discussion	5	10	0
31	Public choice theory, use of economic tools to analyze	5	6	4
36	Sequential questionnaires	5	10	0
13	Incrementalist approach, identifies weakness, not new ideas	4	9	2
22	No face to face meetings	4	11	0
30	Preferred answer or answers	4	8	3
37	Silent independent voting by individuals	4	11	0
48	Vote is anonymous	4	10	1
44	Undefined goals	3	12	0
23	No time constraints	0	15	0
45	Unlimited resources to evaluate each choice	0	15	0

---

*Note.* Responses from 15 crisis leaders. Frequency derived from Qualtrics.

Table 3  
*Top Shared Traits and Associated Models*

<u>Trait</u>	<u># yes</u>	<u>%</u>	<u>Model</u>
Multiple people involved	15	100%	NDM
Conditions continue to change	15	100%	NDM
Assumes objective data	13	87%	RM
More than one response/choice/option	13	87%	MAUA
Organizational goals exists	13	87%	NDM
Rank ordering or rating procedure results	13	87%	NGT
Structure of organization influences outcome	13	87%	PM
Time constraints	13	87%	NDM
All options are assigned a number based on value	12	80%	RM
Conversation & debate	12	80%	NGT
Decision makers are experienced	12	80%	NDM
Focus on more than one issue at a time	12	80%	PM
Outcome decision based on plot	12	80%	MAUA

---

*Note.* 80%-100% Crisis Leaders Use These Traits



Table 4

*Group Decision - Making Models Traits With Associated Question*

	<u>NDM</u>	<u>PM</u>	<u>RM</u>	<u>MAUA</u>	<u>NGT</u>	<u>DT</u>	<u>BM</u>
1	(45)	(22)	(33)	(47)	(40)	(23)	(49)
2	(21)	(12)	(16)	(18)	(50)	(7)	(17)
3	(3)	(6)	(1)	(36)	(25)	(48)	(31)
4	(43)	(29)	(2)	(9)	(8)	(15)	(32)
5	(13)	(10)	(11)	(27)	(4)	(37)	(28)
6	(20)	(30)	(24)	(44)	(38)	(19)	
7	(26)	(14)	(46)		(34)	(44)	
8	(5)	(39)	35)		(41)	(42)	

*Note.* The (#) represents the survey identifier number

**Figure 3. Choice Elimination Theoretical Framework.** The results of the survey were reconstructed back into their models (as seen in table three). This framework ended a reduction/addition process that classified each of the seven models with the removal or inclusion of each process trait. The final product encompasses the common thirteen process traits used in decision-making by the sample of crisis leaders. This framework displays the step by step process of the creation of the decision-making model.

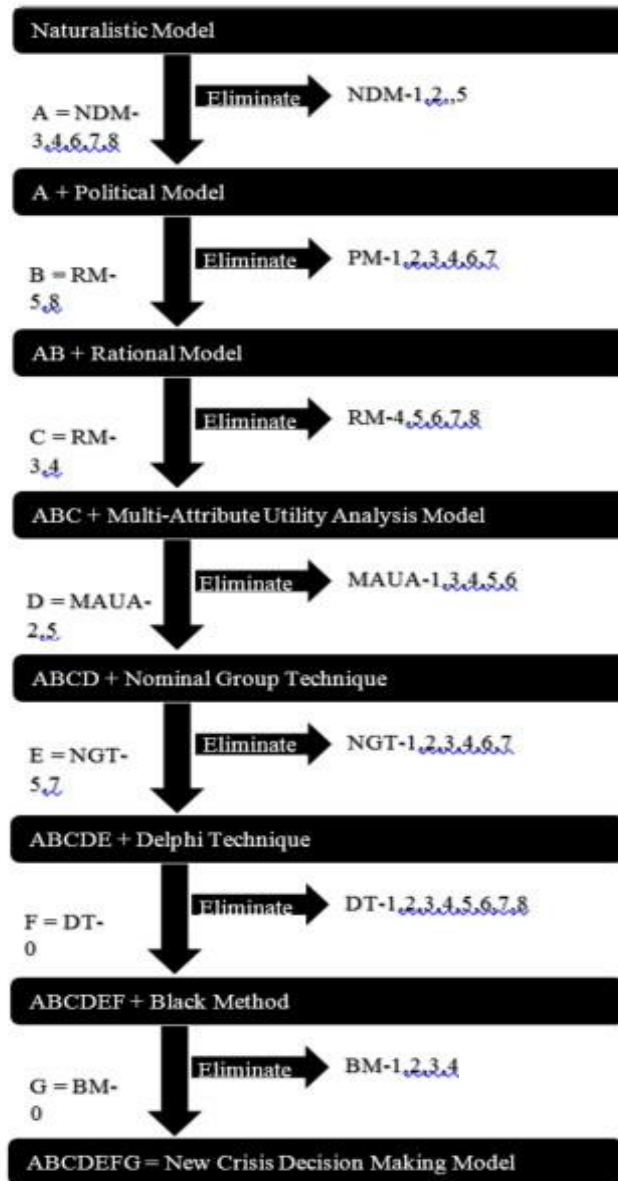


Figure 3. Choice Elimination Theoretical Framework

## **Correlation Testing**

**Shared Decision-Making Processes.** To determine shared decision-making process a bivariate correlation test was performed to determine the linear relationship between two variables with a Pearson Correlation. The other analysis was a Principal Component Analysis (PCA), a variable reduction technique similar to exploratory factor analysis (Widaman, 1993). PCA was chosen to identify shared constellations of decision processes between the individuals, sub-groups and the whole group.

**Bivariate analysis and Pearson correlation.** SPSS Bivariate analysis identified relationships among the crisis leaders based on the fifty traits ( $n=50$ ), the output was the Pearson correlation coefficient identifies the relationship between -1 and 1, and denoted significance in the relationship in gray (see Table 7). The results of this test demonstrated a relationship in decision processes with other members in the sample group. What makes these numbers significant is that while all of the members are experts in crisis leading not all processes of decision-making were shared. The correlation between the models' process traits were also explored (Table 8). This table represents the top three pairs of process traits (Questions 50/42, 50/33 and 47/10) that revealed high correlations,  $r=0.80$  - $0.85$ . Questions 46/24/20/3 returned as errors in the original table (not shown) because all of the experts picked yes, they use the traits, or no, they do not use the traits. Only three items were highly significant confirming the vast majority of process traits are measuring different aspects of decision-making. The core responses of the three pairs were no, they do not use the traits, and did not affect the model

**Dimension reduction factor analysis.** In the SPSS statistical software package, the data were analyzed by Dimension Reduction Factor Analysis, in particular by

Principle Components Analysis (PCA). The PCA method summarized the information by identifying very strong inter-correlations between variables and is one of the most used exploratory data reduction procedures in the social sciences (Osborne & Costello, 2004). Principle Component Analysis sample set is reduced by looking for variance in all of the variables (Fabrigar, Wegener, MacCallum, & Strahan, 1999). This type of factor analysis is best for a practical, real world summary of the data set. The outcome (products) of the PCA is identified as components. PCA is used to reduce the number of variables of interest into a smaller set of components by analyzing all the variance in the variables and reorganizing the data into independent components made up of clusters of original variables.

To guarantee the suitability of the information, such as sample size and the strength of the relationship, assumption tests were conducted prior to the analysis. Small samples mean the  $r$  value is less reliable and will have more variance, so additional steps are imperative. The survey was designed to address the relationship between the responders ( $n=15$ ) concerning their decision-making process and this was accomplished by using 50 variables to determine the relationship. This ratio 3:1 met the minimum for factor analysis (Costello & Osborne, 2003).

**PCA correlations.** This test measures correlation amongst the responders, they are the variable of interest in this test. No multicollinearity or singularity identified. ( $> 0.8$  remove) Factor analysis is a correlation matrix that requires a large sample size to stabilize. Comrey and Lee (1992) suggest a sample size that 1000 is an excellent sample size; however, a sample group of 10 cases is the bare minimum to avoid computational errors. The correlation Matrix, with respect to responders, identified a determinant value

of 0.003. The important factor here is that the determinant is not 0. If the determinant is 0, the factor analysis will have computational problems (Osborne & Costello, 2004). A determinant larger than 0.00001, indicates no multicollinearity.

To be considered suitable some of the correlations must have an  $r$  value of 0.30 or greater, but not all of the correlations must have an  $r$  value  $>0.30$  (Festa et al., 2000; Mukaka, 2012). The strength of the intercorrelations with an  $r$  value of 0.30 or greater was considered for subgroup examination. Table 6 reports the correlations across respondents. The number of intercorrelations at this level determines overall mutual relationships.

As seen in table 6, the strongest correlation coefficient ( $r$  value 0.644) represented a relationship in decision-making traits between a high-ranking government worker and a high-level military doctor. There was an  $r$  value of 0.475 between the same doctor and a global CBRN expert. The global CBRN expert shared traits with an American government worker ( $r = 0.446$ ) and an American high-ranking officer ( $r = 0.408$ ). A United Nations, non-US crisis leader shared decision-making processes with the two US military officers. Five countries were represented in the group of fifteen responders, South Africa, Turkey, United Kingdom, Iran, and the US. Other weak and moderate but significant correlations of interest among the sample set of crisis leaders are described below:

- A local emergency manager shared processes with a local Fire Chief.
- An FBI counterterrorism agent shared decision-making processes with several global crisis leaders, including a U.S. military NATO Emergency officer and Fire Chief.

- U.S. military intelligence officer shared process traits with global, national and local leaders.
- A U.S. military emergency department chief shared process traits with the FBI, UK, and Iran, as well as the U.S. military NATO Emergency officer
- A global C.B.R.N. crisis leader shared decision-making process traits with the U.S. FBI, four U.S. military officers, and one local Fire Chief.
- One Iranian crisis leader shared processes with another Iranian crisis leader.
- One Iranian crisis leader shared decision-making processes with only fellow Iranians and a leader from Turkey.
- The leader from Turkey shared only with three crisis leaders from Iran.
- U.S. military C.B.R.N. leader shared processes with a global C.B.R.N. leader, as well as other U.S. military officers, fire and police chiefs.
- One U.S. military medical intelligence officer (scientist) did not share decision-making processes with any other crisis leader.
- A U.S. military NATO Emergency officer/Fire Chief shared processes with a U.S. military doctor and local Fire Chief, as well as the FBI, global and national C.B.R.N. crisis experts.
- Local Fire Chief shared process with local emergency manager and two U.S. military officers (intelligence and CBRN).
- Local police chief shared process traits with a global UN crisis leader and the U.S. FBI counterterrorism expert.

**Validation of Data.** Assumptions for PCA: Assumption #1: Variables were measured at the continuous level. Assumption #2: A linear relationship between all variables was assumed with scatter plots on random samples (process traits), variables were tested in SPSS and plots confirmed linear relationships (not shown). Assumption #3: Sampling adequacy: (1) the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy for the overall data set; and (2) the KMO measure for each individual variable. (See Table 7). Assumption #4: Data was deemed suitable for for data reduction by Bartlett's test of sphericity (See Table 7).

In Principal Component Analysis and Factor Analysis, it is important that the number of samples exceed the number of data features. Herein, X samples and Y data features are considered to verify that the collected data is suitable for analysis via both methods. As a further check on data appropriateness for PCA, the following two statistical tests were performed: The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) (0 – 1, 0.6 minimum value) and the Bartlett's Test of Sphericity (P-value less than 0.05). Both tests produce a statistical measure of the appropriateness of the interrelationships and suitability of data (See Table 7 for KMO/Bartlett).

*Kaiser-Meyer-Olkin measure of sampling adequacy.* KMO produces a value to reflect the overall “fitness” of the data for factor analysis. The correlation between two variables can be influenced by the other variables. KMO measured the relation between two variables and removed the effect of the remaining variables. This measure varies between 0 and 1, and values closer to 1 are viewed as better for factor analysis. A value of 0.5 is a suggested minimum. Table 7 identifies the KMO for this research as 0.685, verifying suitability.



***Bartlett's test of sphericity.*** The Bartlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is a matrix in which all of the diagonal elements are 1 and all off-diagonal elements are 0. Taken together, these tests provide a minimum standard which should be passed before a factor analysis (or a Principal Component Analysis) should be conducted. Sig. = .000, which indicates a p-value  $< 0.01$ . The low p-value assured that the sample group of 15 accurately represents the population of interest. Some references warned to use Bartlett's test of sphericity only if the number of instances divided by the number of variables is lower than 5. The data contained  $n = 50$  instances (50 process traits) and  $p = 15$  variables (subjects: JS, TS, DS, RM, EO, AK, IPC, CEO, PV, JB, DS2, JK, MR, IB, JB).  $50/15 = 3.33$ , which was less than 5.0.

**Principal Component Analysis.** Examining the data covariance matrix eigenvalues is one approach to determining the number of principal components or factors to retain. The Horns Method toolbox developed by Bigley et al. (2013) was employed to compare various dimensionality assessment heuristics. Due to the data being on a common scale, the analysis considered the data covariance matrix to take advantage of dimensionality assessment heuristics.

Horn's curve recommends retaining two principal components or factors while Kaiser's mean eigenvalue criterion recommends five principal components or factors and the maximum distance secant line approach of Johnson et al. recommends three principal components or factors (see Figure 4). Due to Horn's method being considered more precise than competing heuristics (Bigley, 2013), for analysis, two principal components

were visualized, and then two principal components were rotated through varimax for factor analysis.

**Factor Matrix for PCA.** Examining the data covariance matrix eigenvalues is one approach to determining the number of principal components or factors to retain. The Factor Matrix displayed the factor loadings of all variables on each factor. PCA identified them as components. For this study the components were combinations of the process traits and the variables were the crisis leaders. A factor/component is a linear combination of the original variables. The factor/component loadings are the correlation coefficients between the variables (rows) and the factors (columns) and are analogous to Pearson's  $r$ . The correlations are identified by number and color. Light gray/dark gray and black are the three colors. The higher the number, the greater the relationship, and darker the number (See Figure 5).

**The component plot in rotated space.** This illustration shows the variables in the rotated factor space. It is a visual representation of the loadings plotted in a 2-dimensional space. The plot shows how closely related the traits are to each other and the two components. The relationship represented identify a cluster of sample members' decision-making processes. What is evident here is that there is a clear demarcation of global regions and their shared processes. Crisis leaders from Iran and Turkey have shared decision-making processes. Other non-US members did not have a clear segregation and appeared to be part of the U.S. in their clustering.

**Non Parametric Tests.** Several nonparametric tests were run on this data, both on the process traits and the crisis leaders. Friedman's two-way analysis of variance by ranks and Kendall's coefficient of concordance each showed a significance of 0.005, and

a decision to reject the null hypothesis that the distributions among the crisis leaders are the same. The One-Sample Kolmogorov-Smirnov Test reports a significance of 0.000 to reject the null hypothesis of a normal distribution of the crisis leaders. One-Sample Kolmogorov-Smirnov Test 2 reported a non-uniform distribution. The One-Sample runs nonparametric test on the process traits detects if values occur randomly above or below - 1.0 – 1.0. If there is no significant difference in the observed versus the random order the null hypothesis is retained. Based on the results the responses are random.

### **Summary of Results: Correlations Testing**

Principle Component Analysis identified relationships between the selected sample of crisis leaders and their decision-making processes. The purpose was to elucidate whether the global leaders collectively responded similarly despite their particular fields or culture. The results suggested that there were relationships of significance identified. When the crisis leaders were compared, there were collective similarities and regional differences in their shared decision processes.

### **The New Decision-Making Model**

Decision-making models direct the decision-making process and guide options for choosing a course of action. Models are made up of decision process traits that create structures and/or focal points to help leaders attend to important contextual information and prior experiences when making decisions. This research suggested thirteen decision process traits that compose a new model for high-stakes decision-making.

The Choice Elimination Theoretical Framework enabled paring down of fifty process traits seven current decision-making models to thirteen traits drawn from parts of

five models. The sampled crisis leaders identified thirteen shared process traits they used in their crisis decision-making. These process traits organize a leaders' attention to three categories of influence: situational awareness, group dynamics, and decision-making actions. For this study three categories are drawn from current literature and are defined as follows: situational awareness is defined as an appropriate awareness of a situation (Smith & Hancock, 1995); group dynamics refers to the forces operating in groups (Cartwright, 2008); decision-making actions determine how solutions or decisions are chosen (Vroom & Yetton, 1973). (Table 11). Appendix B includes detailed definitions of all process traits, including the ones used by 80-100% of polled crisis leaders represented in this new model (see Table 11). The traits do not work alone. It is the influence of the Contextual Factors that turn crisis into a high stakes crisis. Contextual Factors have a specific role in crisis decision-making. The process traits of a model and the decision-makers are influenced by these contextual factors characteristic of crises (See Figure 8). Below is a discussion of how the new model works to help the leader attend to the ways the factors interface with the thirteen process traits that make up the new model.

**Situational awareness.** The leaders must recognize a need for situational awareness when making crisis decisions in the following areas: Acknowledge that the conditions are not fixed; they will continue to change during the decision-making process. The crisis leaders must be aware of the organizational goals and the influence the organization has on the outcomes. Lastly, be aware of time constraints when making decisions.

**Group dynamics.** The crisis leaders believed that the group dynamics aid in better decision-making when following this process: Have multiple people involved and

that the people be experienced (when possible). The meetings are best when the members are open for conversation and debate. The group will perform at its best when they focus on more than one issue at a time.

**Decision-making actions.** Relating specifically to the decision-making process the experts shared that the final outcome or options should be based on a plot. All decisions should be made with more than one response/choice/option. There should be a rank ordering or rating system of the options. All of the options should be assigned a number based on value.

### **NDM vs. The New Model**

The NDM model is a twenty-five year old model developed by Klein & Klinger (1991). Research for the NDM model was done by observing decision-makers such as firefighters and emergency room personnel. Literature suggested, and my findings validated, the NDM is the model most closely aligned with how leaders make decisions in a crisis. The model is the antecedent and provides five of the thirteen process traits used in the new model (see Table 10). The NDM model has eight traits but three of the model's process traits were used by less than fifty percent of the sampled Crisis experts (see Table 9). The NDM model has other drawbacks, it relies heavily on the experience and instincts of the crisis leader to determine the course of action. Therefore, the model does not offer assistance to the inexperienced crisis leader. Klinger and Klein (1992) discuss the involvement of multiple people but highlight the experienced, individual decision-maker.

Table 5

*Questionnaire Results From 15 Responders*

<u>Trait</u>	<u>JS</u>	<u>TS</u>	<u>DS</u>	<u>RM</u>	<u>EO</u>	<u>AK</u>	<u>IPC</u>	<u>CEO</u>	<u>PV</u>	<u>JB</u>	<u>DS2</u>	<u>JK</u>	<u>MR</u>	<u>IB</u>	<u>JG</u>
All options are assigned a number based on value	y	y	y	y	n	y	y	y	y	y	n	y	n	y	
Assumes objective data	y	y	y	y	y	y	y	y	n	y	n	y	y	y	
Conditions continue to change	y	y	y	y	y	y	y	y	y	y	y	y	y	y	
Conversation & debate	y	y	y	y	y	y	y	y	y	n	n	y	y	y	
Decision makers are experienced	y	n	y	y	y	y	y	y	n	y	n	y	y	y	
Decision-making is seen as a battle	y	n	n	y	n	y	y	y	n	y	n	n	n	y	
Decisions made by group without contact	u	n	y	n	n	n	y	y	y	y	n	n	n	n	
Discussion of the recorded ideas to clarify/evaluate	n	y	n	y	n	y	y	y	y	n	y	y	n	y	
Each option weighed and considered	y	y	y	y	n	n	n	n	y	n	y	y	y	y	
Focus on more than one issue at a time	y	y	y	y	y	n	n	y	y	y	n	y	y	y	
Formal process of analysis	n	y	y	y	y	y	y	y	y	y	n	u	n	y	
Goals defined by self interest	u	n	n	n	n	y	y	y	y	y	y	n	n	y	

High stress environment	n	y	n	y	y	n	n	n	n	y	n	y	y	n
Incrementalist approach	y	n	y	u	y	n	n	n	y	n	n	n	n	n
Internet needed	y	n	y	n	n	y	y	y	y	y	n	y	y	n
Known objectives	n	y	y	y	y	n	y	y	y	y	n	y	n	y
Member has the option to abstain	u	y	y	y	n	n	n	y	n	n	y	y	n	y
More than one response/choice/option	u	y	y	y	y	y	n	y	y	y	y	y	y	y
Multiple rounds	n	y	y	y	y	n	n	y	y	y	y	n	y	y
Multiple people involved	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Needed information is missing	y	y	y	y	y	n	n	n	y	y	n	y	y	n
Needs of the members outweigh rationality	y	y	n	n	u	y	y	y	n	n	n	y	n	n
No face to face meetings	n	n	n	n	n	n	y	n	y	n	n	n	n	y
No time constraints	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Oral phase, sharing options without discussion	n	y	n	y	n	n	y	n	n	n	y	n	n	n
Organizational goals exists	y	y	y	y	y	n	y	n	y	y	y	y	y	y
Outcome decision based on plot	u	y	y	u	u	y	y	y	y	y	y	y	y	y

Point system	n	n	y	n	n	y	y	y	y	y	n	n	n	y
Power and influence weigh heavily on outcome	y	n	y	n	n	y	y	n	n	y	y	n	y	n
Power is decentralized	n	y	n	y	y	y	n	n	n	y	n	y	n	y
Preferred answer or answers	u	n	n	n	n	n	y	y	n	n	y	u	y	n
Public Choice Theory, Use of economic tools to analyze	u	n	n	n	n	n	y	y	n	y	n	u	y	n
Quantitative Approach	n	n	n	y	n	y	y	y	y	y	y	y	n	y
Rank ordering or rating procedure results	n	y	y	y	y	y	y	y	y	y	y	y	n	y
Requires complete knowledge of information about alternatives	n	y	n	y	y	y	y	y	y	n	n	n	n	y
Results are plotted	n	y	n	n	n	y	y	y	y	n	y	n	n	y
Sequential questionnaires	n	n	n	n	n	y	n	y	n	y	n	n	n	y
Silent independent voting by individuals	n	n	y	y	n	n	y	n	n	n	n	n	n	y
Structure of organization influences outcome	y	y	y	y	y	y	n	n	y	y	y	y	y	y
Structured, sitting around a table	y	n	y	y	y	y	y	y	y	y	n	n	y	y
The "group decision" is the pooled outcome of individual votes	n	y	u	y	n	y	y	y	y	n	n	y	n	y
The responses are shared with group prior to next round	n	y	u	y	n	y	y	y	y	y	n	y	n	y



Time constraints	y	y	y	y	y	y	y	n	y	y	y	y	y	y
Time-consuming	n	n	n	n	u	n	n	n	y	y	y	y	y	n
Undefined goals	y	n	n	n	n	n	n	n	n	n	y	n	n	n
Unlimited resources to evaluate each choice	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Useful for everyday decisions	y	y	y	y	n	n	n	y	y	y	n	y	y	y
Vote is anonymous	n	n	y	n	u	y	y	n	n	n	n	n	n	y
Weighted Responses	n	y	y	y	n	n	y	n	y	y	y	n	n	n
<u>Writing phase, all the options on paper</u>	<u>n</u>	<u>n</u>	<u>u</u>	<u>y</u>	<u>n</u>	<u>y</u>	<u>y</u>	<u>y</u>	<u>y</u>	<u>y</u>	<u>n</u>	<u>y</u>	<u>n</u>	<u>y</u>

*Note.* Responders had the option to respond with one of three constructs. Yes, they employ this trait in their decision-making process; No, they do not employ this method; or Unsure, they do not know if they use this in their decision-making process.

Table 6

*PCA/Pearson Correlation*

	<u>JS</u>	<u>TS</u>	<u>DS</u>	<u>RM</u>	<u>EO</u>	<u>AK</u>	<u>IPC</u>	<u>CEO</u>	<u>PV</u>	<u>JB</u>	<u>DS2</u>	<u>JK</u>	<u>MR</u>	<u>IB</u>	<u>DF</u>
JS	1	0.076	0.427	0.116	0.264	0.076	-0.04	0.041	0.045	0.182	0.101	0.284	0.58	-0.04	0.008
TS	0.076	1	0.284	0.644	0.446	0.097	-0.06	0.122	0.33	0.074	0.264	0.544	0.183	0.327	0.328
DS	0.427	0.284	1	0.4	0.408	0.07	0.069	0.086	0.391	0.346	0.049	0.267	0.391	0.291	0.266
RM	0.116	0.644	0.4	1	0.475	0.119	0.006	0.124	0.294	0.248	0.085	0.501	0.172	0.509	0.211
EO	0.264	0.446	0.408	0.475	1	0.148	-0.13	-0.01	0.22	0.309	-0.06	0.355	0.45	0.238	0.287
AK	0.076	0.097	0.07	0.119	0.148	1	0.459	0.459	0.159	0.245	0.02	0.203	-0.06	0.504	0.24
IPC	-0.04	-0.06	0.069	0.006	-0.13	0.459	1	0.379	0.141	0.051	0.003	-0.05	-0.17	0.206	0.227
CEO	0.041	0.122	0.086	0.124	-0.01	0.459	0.379	1	0.253	0.253	-0.09	0.229	-0.01	0.418	0.231
PV	0.045	0.33	0.391	0.294	0.22	0.159	0.141	0.253	1	0.287	0.211	0.269	0.126	0.359	0.501
JB	0.182	0.074	0.346	0.248	0.309	0.245	0.051	0.253	0.287	1	0.041	0.313	0.381	0.175	0.41
DS2	0.101	0.264	0.049	0.085	-0.06	0.02	0.003	-0.09	0.211	0.041	1	0.129	0.188	0.053	0.232
JK	0.284	0.544	0.267	0.501	0.355	0.203	-0.05	0.229	0.269	0.313	0.129	1	0.425	0.261	0.292
MR	0.58	0.183	0.391	0.172	0.45	-0.06	-0.17	-0.01	0.126	0.381	0.188	0.425	1	-0.04	0.146
IB	-0.04	0.327	0.291	0.509	0.238	0.504	0.206	0.418	0.359	0.175	0.053	0.261	-0.04	1	0.225
DF	0.008	0.328	0.266	0.211	0.287	0.24	0.227	0.231	0.501	0.41	0.232	0.292	0.146	0.225	1

*Note.* Determinant = .003, gray areas represent  $r > 0.3$

Table 7

KMO and Bartlett's Test

---

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.685
Bartlett's Test of Sphericity	Approx. Chi-Square	248.077
	df	105
	Sig.	0

---

*Note.* PCA Appropriateness. KMO >0.6, Sig <0.01

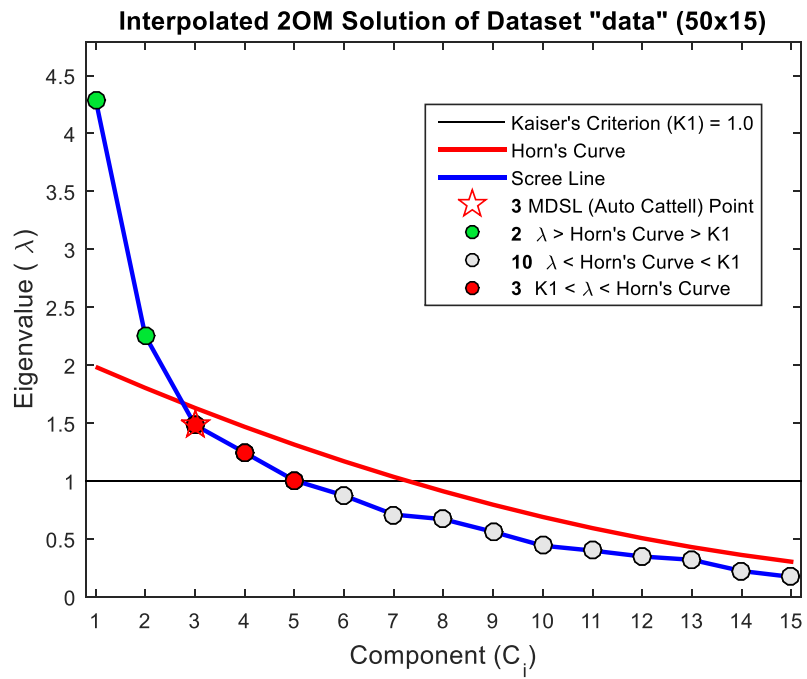
Table 8

*Coefficients for the Highly Correlated Process Traits*

<u>#</u>	<u>Process Trait</u>	<u>Y</u>	<u>N</u>	<u>U</u>	<u>r</u>
50	Unlimited resources to evaluate each choice	0%	100%	0%	0.849
42	Public choice theory, use of economic tools to analyze	36%	45%	50%	
50	Unlimited resources to evaluate each choice	0%	100%	0%	0.812
33	Weighted Responses	55%	45%	0%	
47	Preferred answer or answers	18%	64%	50%	0.819
10	Focus on more than one issue at a time	82%	18%	0%	

*Note.* Highest correlation among the process traits as reported by SPSS.

Figure 4. Examining the data covariance matrix eigenvalues is one approach to determine the number of principal components or factors to retain. The Horns Method compares various dimensionality assessment heuristics. Due to the data being on a common scale, the analysis considered the data covariance matrix to take advantage of dimensionality assessment heuristics.



**Figure 4 Eigenvalues**

**Figure 5 Factor Matrix for PCA.** Examining the data covariance matrix eigenvalues is one approach to determine the number of principal components or factors to retain. The PCA matrix displays the factor loadings of all variables on each factor. A component is a linear combination of the original variables. The factor/component loadings are the correlation coefficients between the variables (rows) and the factors (columns) and are analogous to Pearson's  $r$ . The correlations are identified by number and color. Light gray/dark gray and black are the three colors. The higher the number the greater the relationship, and darker the number.

Loading Matrix															
	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6	Prin7	Prin8	Prin9	Prin10	Prin11	Prin12	Prin13	Prin14	Prin15
JS	0.37668	-0.43428	0.52786	-0.00407	0.35840	0.26566	-0.08466	0.08422	-0.10569	-0.11472	-0.21664	0.12019	0.28821	-0.01374	0.09283
TS	0.66173	-0.11419	-0.57305	-0.06199	0.16651	-0.04790	-0.02767	0.22356	-0.00370	0.09650	-0.14883	0.13789	-0.13379	-0.24337	0.09195
DS	0.63095	-0.20656	0.20164	-0.04167	-0.22604	<b>0.54284</b>	-0.09185	-0.03743	0.14578	-0.04445	-0.18114	-0.11629	-0.29206	0.06226	-0.04996
RM	0.69174	-0.06042	<b>-0.41137</b>	-0.31189	0.03254	0.10527	-0.00594	-0.07372	<b>0.32743</b>	0.03499	0.05213	0.07944	<b>0.25244</b>	0.04339	-0.22507
EO	0.63449	-0.31283	-0.01491	-0.32670	-0.18500	-0.02462	<b>0.42083</b>	0.11891	-0.23573	0.20374	0.07868	0.08839	-0.01685	0.22147	0.07825
AK	0.40221	0.63926	0.24904	-0.09712	0.29253	-0.05991	0.36789	-0.09197	-0.16501	-0.21582	-0.06033	0.09125	-0.11474	-0.06745	-0.14724
IPC	0.14019	0.66753	0.25530	0.14962	0.11600	0.25995	0.11555	<b>0.42455</b>	0.31002	0.06953	0.24843	0.02113	0.01738	0.00028	0.09564
CEO	0.38276	0.60298	0.25320	-0.10227	0.13856	-0.18126	<b>-0.43617</b>	-0.00123	-0.11259	<b>0.35881</b>	-0.12264	0.03941	-0.03224	0.10759	-0.04907
PV	0.59108	0.18268	-0.13037	0.34358	-0.37686	0.18466	-0.27938	-0.02665	-0.30003	-0.17395	0.23772	0.22029	0.03814	-0.01534	-0.01764
JB	0.55488	-0.00021	<b>0.41103</b>	0.10107	-0.34683	<b>-0.36070</b>	0.07441	-0.29978	<b>0.33733</b>	-0.00522	-0.05257	0.18495	-0.00772	-0.06074	0.11226
PHY	0.23266	-0.12288	-0.25716	<b>0.77625</b>	0.38471	0.06061	0.14065	-0.22530	0.05180	0.12393	-0.01584	0.03265	-0.03641	0.13836	0.00585
JK	0.69285	-0.15773	-0.09150	-0.10374	0.27590	<b>-0.36702</b>	-0.22714	0.13502	0.08247	<b>-0.34416</b>	0.10260	-0.13116	-0.08811	0.17469	0.06360
MR	0.50535	<b>-0.59218</b>	<b>0.41482</b>	0.09280	0.14460	-0.10146	-0.01497	-0.00234	-0.06501	0.17382	<b>0.28121</b>	-0.14763	-0.04531	-0.18225	-0.10601
IB	0.56611	0.46996	-0.19160	-0.23660	0.07698	0.20118	0.02470	<b>-0.41432</b>	-0.09031	0.03094	0.08661	-0.28090	0.11561	-0.07877	0.17947
DF	0.57875	0.20530	-0.02839	<b>0.42767</b>	-0.36758	-0.19832	0.14286	0.27589	-0.06989	-0.01377	-0.22730	-0.27809	0.17306	-0.02628	-0.05919

**Figure 5 Factor Matrix for PCA**



**Figure 6. The Component Plot in rotated Space.** This illustration shows the variables in the rotated factor space. It is a visual representation of the loadings plotted in a 2-dimensional space. The plot shows how closely related the traits are to each other and to the two components.

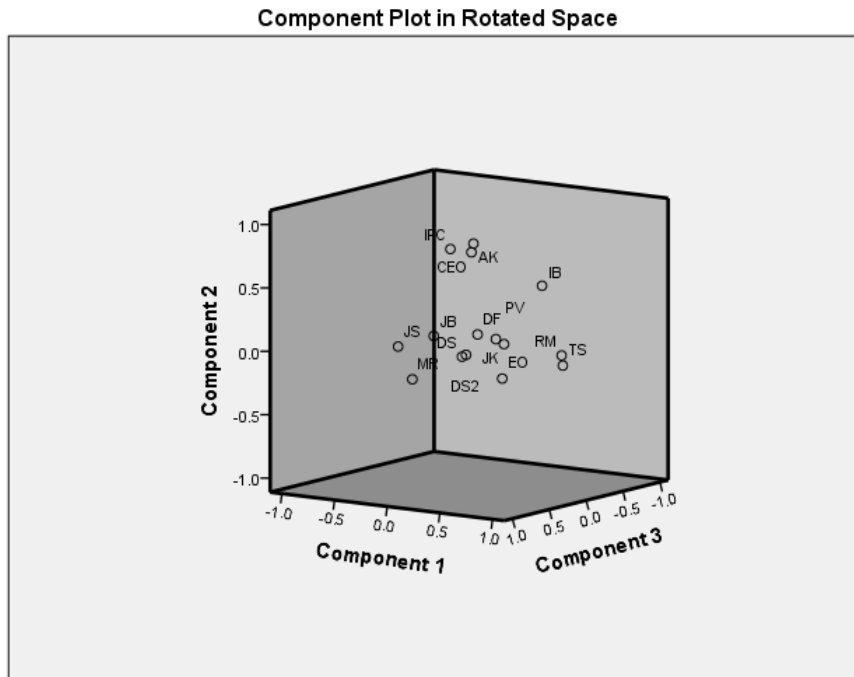


Figure 6. Component Plot in Rotated Space

Table 9

*New Decision-Making Model*

<u>Situational Awareness:</u>	<u>Group Dynamics:</u>	<u>Decision-Making Actions:</u>
Assumes objective data	Conversation & debate	All options are assigned a number based on value
Conditions continue to change	Decision makers are experienced	More than one response/choice/option
Organizational goals exist	Focus on more than one issue at a time	Outcome decision based on a plot
Structure of organization influences outcome	Multiple people involved	Rank ordering or rating procedure results
Time constraints		

*Note.* >80% of the sample group of crisis leaders practice these traits when making high-stakes decisions.

Figure 7. Venn diagram of the new decision-making model. The new decision-making model thirteen process traits were defined by three categories best represented by the traits. Situational Awareness, Group Dynamics, and Decision-making Actions.

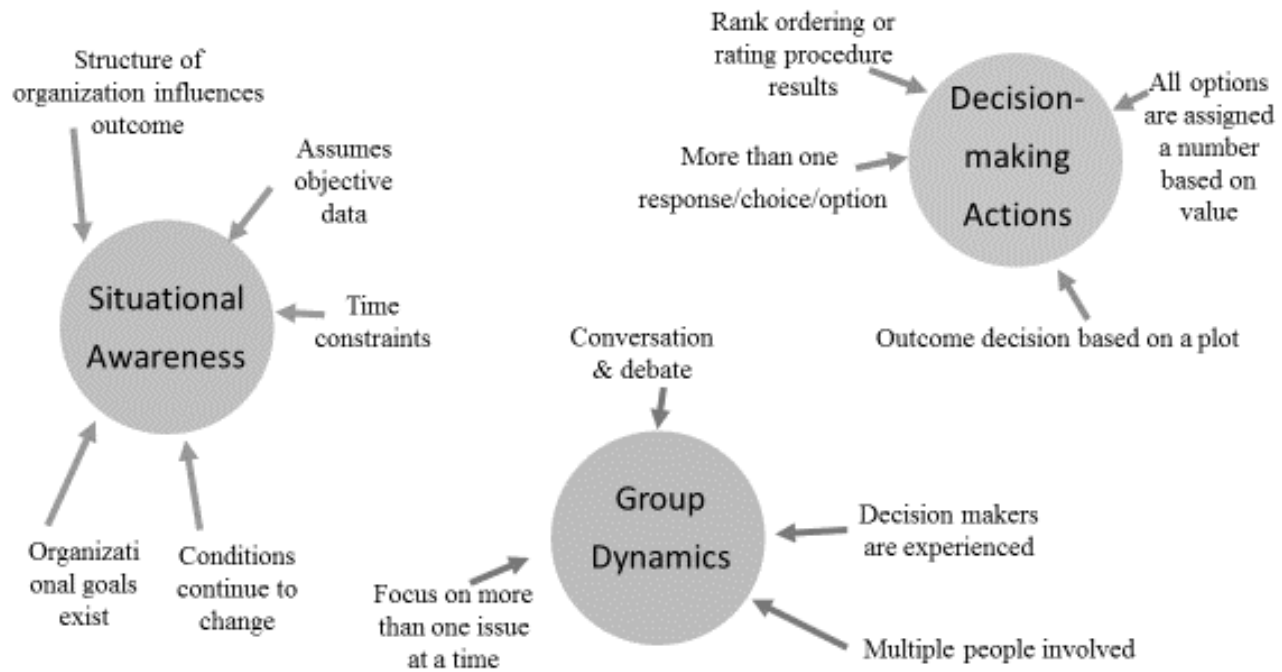


Figure 7 Venn diagram of the new decision-making model

Figure 8. Venn diagram of the new decision-making model with the factors that affect the decision-making process. The new decision-making model thirteen process traits were defined by three categories best represented by the traits. Situational Awareness, Group Dynamics, and Decision-making Actions. Factors that influence or interfere: extreme insecurity and vulnerability; high cost, including loss of life, potential armed conflict, and victims; greater unknowns and evolving outcomes; stakeholders; enemies; media and transparency; politics, and bias.

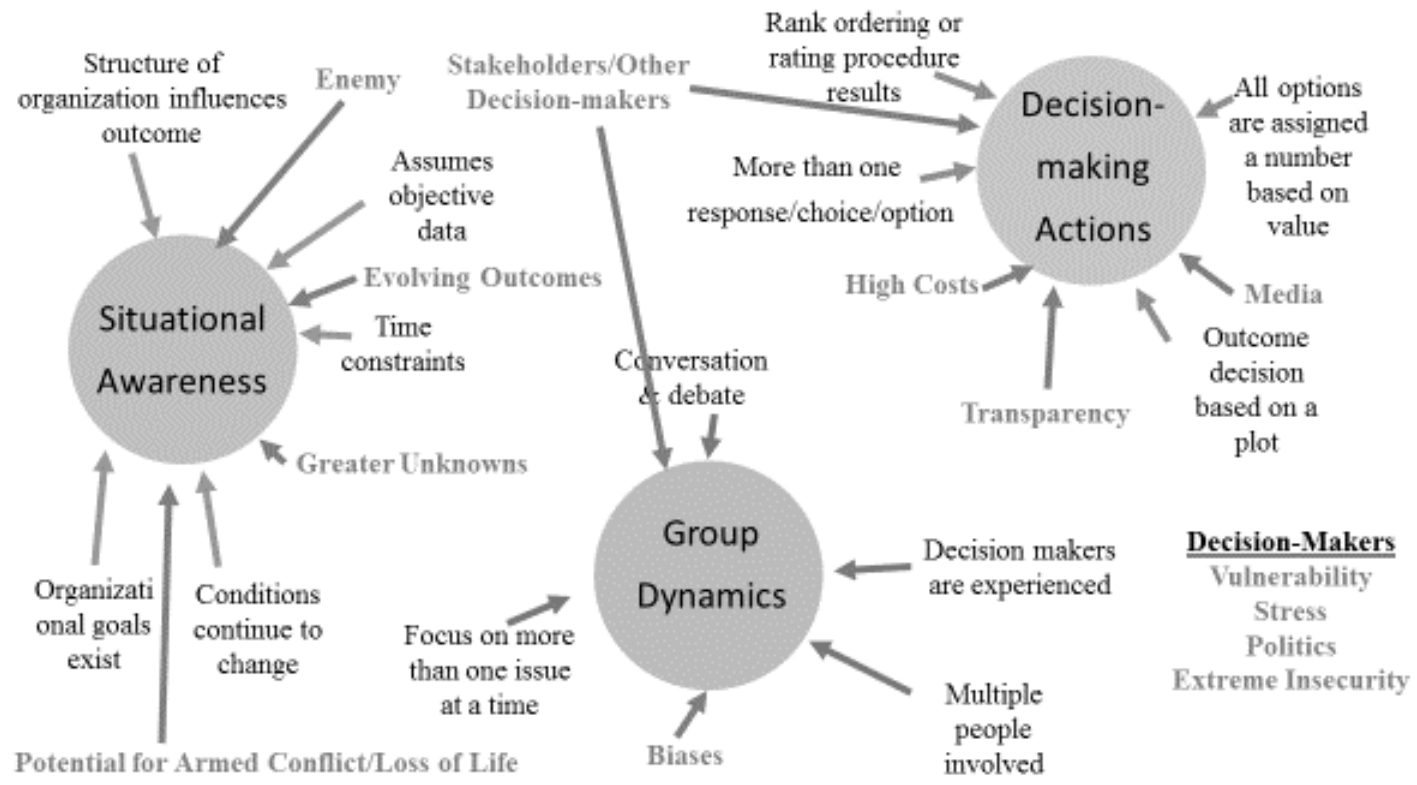


Figure 8 Venn Diagram of the New Crisis Decision-Making Model and Contextual Factors

Table 10

NDM's Contribution to the New Decision-Making Model

<u>Situational Awareness:</u>	<u>Group Dynamics:</u>	<u>Decision-Making Actions:</u>
Assumes objective data	Conversation & debate	All options are assigned a number based on value
Conditions continue to change	Decision makers are experienced	More than one response/choice/option
Organizational goals exist	Focus on more than one issue at a time	Outcome decision based on a plot
Structure of organization influences outcome	Multiple people involved	Rank ordering or rating procedure results
Time constraints		

*Note.* The NDM model contributed five process traits to the new model (in gray). Although the contribution provides a sound foundation it does not complete the picture.



Table 11

NDM Model's Process Traits That Did Not Make the Cut

<u>Process Trait</u>	<u>Percent of Crisis Leaders Usage</u>
Conditions continue to change	100.00%
Multiple people involved	100.00%
Decision makers are experienced	90.00%
Organizational goals exists	80.00%
Time constraints	80.00%
Needed information is missing	50.00%
High stress environment	40.00%
Undefined goals	20.00%

*Notes.* Greater than eighty percent of the sample set of crisis experts use five of the NDM model's process traits; however, fifty percent or less claimed to use the other three.

## **CHAPTER FIVE**

### **DISCUSSION**

Three areas served as a foundation for this research, crisis leadership, factors contributing to crisis decision-making, and decision-making models. Research of the current literature revealed factors that affect crisis decision-making and support the unique nature of crisis decision-making. This study sprang from a hypothesis that high-stakes decision-making process traits are not adequately captured by current decision-making models. This hypothesis was tested by examining decision-making processes practiced by an expert panel of global, national, and local crisis leaders. Expert crisis leaders' common decision-making process traits were analyzed, and the research suggested that no current decision-making model adequately captured the process of high-stakes decision-making by these crisis leaders.

A review of literature identified contextual factors characteristic of crises that influence high-stakes decision-making. The research acknowledged the factors contributions or influences, and offered solutions to moderate their influences. The factors are important to this research because they set apart crisis decision-making from other decision-making fields.

While addressing the factors, this study reflected on strategies that will support and enable the decision-maker to improve their crisis decision-making efforts. By identifying the factors that influence crisis leaders' decision-making an understanding of

crisis leadership has been enhanced. This research suggested ways decision-making can be improved. This study was based on the assumption that high-stakes crisis leaders must take into account unique contextual factors that other decision-makers need not address.

This literature confirmed that crisis decision-making differed from other decision-making because of the contextual factors that influence the decision process during a crisis. The individual factors interface with the decision models in various ways. The factors offer the decision-makers a greater situational awareness that will improve their decision making such identifying the enemy and costs. The decision-makers can also be affected by the factors, in particular the factors of bias and stakeholders. The decision processes can also be influenced by factors such as, evolving outcomes and greater unknowns. Contextual factors not only influence the models but the individual decision-makers. The following factors were identified in the literature as factors that influence or are influenced by decision-makers: extreme insecurity and vulnerability; high cost, including loss of life, potential for armed conflict, and victims; greater unknowns and evolving outcomes; enemies; media and transparency; stakeholders, bias, and politics.

This study was conducted using a non-experimental relational design to examine patterns in the decision-making processes of a selected sample of crisis experts through their responses on a survey instrument. A decision-making model describes the method a person or team will use to make decisions. The models selected for this research were chosen based on frequent citation in current literature. Careful attention was paid to include a variety of representative models in the study. When choosing the seven models diversity in types was important. Models that allowed for group discussion or silent

voting, models that gave weight to options or outcomes, and models that allowed for distance voting held significance in the selection process. The models were deconstructed into fifty identifiable process traits and their usage identified by crisis leaders resulted in a frequency of use percentage for each process trait. Process traits were defined in this study as traits that relate to the different decision-making models as defined by their authors. The process traits were gleaned from the authors that defined the models, when possible, via published papers, or by authors that used or researched the traits. The results indicate that thirteen of the process traits were used by >80% of the selected sample of crisis leaders.

Additional studies examined shared decision processes, commonly used by the fifteen crisis leaders. Correlations were found between individuals in the selected sample group and the group as a collective. Frequency analysis revealed the process traits used by >80% of the crisis leaders and indicated that aspects of several models were represented in their decision-making. The correlation studies were performed to identify significant relationships amongst the sample group of crisis leaders. The correlation coefficients indicated several weak and moderate positive linear relationships between sampled crisis leaders. The strength of the correlations did not fit any pattern related to the subjects' professions. The illustration of a component plot in rotated space did indicate some regional groupings. The shared regional process traits of the component plot were corroborated with an observed noticeable trend in the shared decision processes of the global leaders from Turkey and Iran. The crisis leaders from Turkey and Iran shared process traits almost exclusively with each other, but not other global leaders. Rarely did the occupation of the leaders show similarities in the shared decision-making

processes; however, in one case a global and a national C.B.R.N. crisis leader shared decision-making traits. The U.S. FBI Counterterrorism agent and a global WMD expert shared traits with global, national, and local crisis leaders. This finding demonstrates the ubiquitous nature of crisis decision-making while recognizing cultural trends.

### **Discussion of Findings**

A new high-stakes decision-making model was identified, composed of the thirteen shared process traits identified in survey responses by the sampled crisis leaders. Analysis revealed patterns of shared decision-making between individuals, sub-groups, and the whole group. Findings revealed common decision-making process traits used by the experts included some traits from five of the seven current decision-making models selected for this study supporting the need for a new model. The thirteen shared decision-making process traits provided the components for the new model.

Examination of the process traits revealed the way the traits assist the leader can be clustered in three categories: situational awareness, group dynamics, and decision-making actions. These categories help explain how the model works in helping the leader attend to the contextual factors characteristic of crises. The three categories best summarize the thirteen decision process traits a team will use to guide decisions and the influencing factors the team must consider in decision-making.

Each of the categories include process traits found in three different current models. Situational Awareness had traits from the models: RM, NDM, and PM. Group Dynamics included NGT, NDM, and PM. The Decision Making Actions category is comprised of traits from the RM, MAUA, and the NGT models. The heterogeneity of the

new model and its categories corroborates the hypothesis that high-stakes decision-making process traits are not adequately captured by current decision-making models.

The Situational Awareness category as defined by the experts, includes the process traits: Evolving conditions, organizational goals exist and influence the outcomes. Furthermore, the experts acknowledge the time constraints when making decisions. For the Group Dynamics category the experts believe that success may be due to the involvement of multiple experienced people. The meetings are best when the members are open for conversation and debate. The group will perform at its best when they focus on more than one issue at a time. The Decision-making Actions category shows the importance the experts put on a plot-driven process, multiple rank-ordered options or outcomes-explored, and each option should be assigned a number based on value.

This new crisis decision-making model will guide crisis leaders' high-stakes decision-making. The model encompasses several aspects of decision-making and describes a method a crisis leader can use to make decisions. The new model supports an open communication style for all members and the need to have decision-makers with experience when possible. In a crisis time may be limited, and it is best not to focus on just one issue. This new decision-making process includes a plot driven analysis of options, with ranked outcomes. These process traits represent a more time-consuming scientific approach to decision-making than one would expect due to the time constraints typical of acute crisis decision-making.

This new decision-making model describes the method a team will use to make decisions. There are thirteen process traits identified in the model that the sample set of crisis leaders said they frequently practice to make crisis decisions. The process traits originate from five different popular models but no other model captures the process traits included in this new model. To understand how this new model can be used in a crisis, the following example is provided.

School shootings are occurring all over the country. The expression “school shooting” refers to violence involving firearms occurring in educational institutions, especially the random killing of people within the institution (Preti, 2008). The school principal is an example of a leader not always trained in high stakes decision-making for crisis leadership. When responding to a crisis, one school principal said: “I just didn’t know what I didn’t know” (Low, 2008). Low (2008) goes on to say when a crisis occurs that impacts students the leaders have the power to react, but the lack of training leads to poor crisis decisions. Mass shooting or mass murder-suicide incidents at schools require understanding and intervention by their leaders (Thompson & Kyle, 2005).

The school principal has to act. The new model has a *situational awareness* category, directing the principal to attend to appropriate environmental cues, rules, and changing circumstances. The principal must acknowledge the rules and goals of the school and keep them in mind as they go forward in responding to the crisis. The rules may include a lock down process, or just an awareness that the students are the primary safety concern. Another situational awareness the principal must be aware of is that the circumstances can change rapidly and frequently.

The second category in the new model directs the principal's attention to *group dynamics*. The principal will need choose his team. Principal Christopher Garran (2013) shared his experiences in a large U.S. high school where several students and staff died during his tenure. Principal Garran went on to say that he believes that while the numbers may be lower depending on the high school, that all principals will experience a similar crisis in their tenure, and may not be prepared. His crisis team consisted of his assistant principal, the administrative secretary, and the head of counseling (Garran, 2013). The new crisis decision-making model supports the need to choose decision-makers with experience. Experience can mean knowledge of the student body or the school that someone like an administrative secretary may have, or it could mean knowledge of the influence contextual factors have on the decision-making process, such as stress and unknowns, like the head of counseling may have. The new model supports an open communication style for all members. The crisis leader understands that time may be limited, and it is best not to focus on just one issue. The principal must put a team together that can make decisions quickly and with confidence, and with the ability to multi-task.

The third category of the model focuses the principal's attention on the decision-making actions. Some action steps may seemed counterintuitive to the acute crisis experience. The process traits represent a scientific approach to deciding that one would not expect due to the time limits of acute crisis decision-making. The school principal will need to work with his/her team to determine possible outcomes and assign a ranking system, then plot the results to determine the best solution.



The model also focuses the principal's attention on the role influencing factors play in the decision-making process. The factors are important to attend to because they set apart crisis decision-making from other kinds of decision-making. The school principal and his team will benefit from an awareness of the factors and how the factors will interface and influence with the process. For example, when forming the decision-making team bias can exist. The principal is the leader of the school, the opinions of the principal may carry more weight than the other team members in spite of his or her experience. The decision-makers may have family members in the school and that bias may determine the decision to act, like choosing one hot zone to be cleared quicker than another.

Bias is just one example of several factors the school team needs to consider. Media is another. Trump (2015) is a consultant for a school district, and he works with schools to increase their preparedness. His team looked at documented threats to schools in 2013-2014 and found 300 school bomb threats, hoaxes and acts of violence in 43 states. The costs (another factor) of these incidents to taxpayers are overwhelming. Ideally, school leaders have a school emergency preparedness plan, as well as a crisis communication and a social media plan in place before they are needed.

Below is another example of applying the new model by revisiting the Cuban Missile Crisis situation discussed in Chapter 2.

*When President Kennedy threatened the Soviet Union during the Cuban missile crisis, "remove your missiles or else." He shared only part of the information with the American public thus gaining support for his decision and allowing the public to increase*

*his “power,” by making the coercive threat stronger, thus leading to only two outcomes, comply or go to war. President Kennedy neglected to share with the public was that the outcome included a third option, removal of US missiles from Turkey.*

The new high-stakes decision-making model directs the leader’s attention to the three categories of decision process traits.

Situational Awareness:

*Assumes objective data*, the decision makers must assume all of the intelligence data they are receiving is objective.

*Conditions continue to change*, enemies are not always rational, they can perceive threats when none exist, they can act due to feeling of powerlessness.

*Organizational goals exist*, in this case what are the international laws and be prepared to follow them.

*Structure of organization* influences outcome, in this case the President and his decision-makers had to be aware of their own power and capabilities.

*Time constraints*, if they exist what are they, if Russia does not move the missiles in 5 days? 5 hours?

Group Dynamics:

*Conversation & debate*, debate and conflict often give rise to other options.

*Decision makers are experienced*, their experience may not be in “conflict” but in

Communications, Law...heterogeneity = good practice

*Focus on more than one issue at a time*, the missiles being removed is just one part of the crisis, what if it doesn’t happen? The Crisis leaders must think of potential for war and decision making for that outcome.

*Multiple people* involved in the decision-making process.

Decision-Making Actions: (see Figures 9-12)

*All options are assigned a number based on value.* For this simulation the decision makers came to an agreement to have 6 options: Invade Cuba, invade Russia, renegotiate, send select troops to find the missiles, Do nothing, or do both A & B. (Figure 9)

*More than one response/choice/option.* Each of the Decision-makers picked the options they favored. If it was a favorite the option(s) received a 1. If it was a second favorite the option(s) received a 2. If it was a third favorite the option received a 3. If there was an option that the maker disliked it received a 0. Not all numbers had to be used. (Figure 10)

*Rank ordering or rating procedure results.* All of the options were tallied and the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, and no choices were identified. (Figure 11)

*Outcome decision based on a plot.* All of the options were plotted and the support each option had is easy to identify, at a glance. Eighty percent of the decision-makers voted as their first or second choice to invade Cuba. An equal number of decision-makers opted to invade Russia as their first choice; however, fewer chose that option as their second choice. No decision-maker picked as their first choice to send in the troops, and only one decision-maker believed doing nothing was acceptable. This was just a simulation to show the new model in use.

This simulation included an oversimplified example of the Decision-making actions. The actual use can become quite complex. The Situational Awareness category includes five process traits. The category appears quite intuitive, while borrowing traits from two rational decision-making models, and one blended. Three of the models are

represented in this category, the NDM, RM, and PM models. For this scenario the process trait, assume objective data, emphasized the need for the intelligence data to be objective. There has been much debate on the intelligence data that initiated the wars in the gulf on its validity and objectivity. While the decision-makers should assume this to be true, the data is objective, this should not be done blindly. In many crises the information is derived from the media and is seldom, if ever, objective. The common consensus among the crisis experts is the recognition of time constraints. The new model will not work if one is deciding on the value of sending their people into immediate harm and they have mere seconds to decide, but for a crisis that have the fate of the population in their hands the decision-makers need to reflect on their choices methodically, with compassion and with purpose.

The Group Dynamics Category included four process traits, also from three different models, the NGM, NDM, and PM. For this scenario the process trait “decision-makers are experienced” emphasized the different types of expertise, such as law, leadership, and communications. The “focus on more than one issue at a time” process trait was oversimplified here as well. For a decision of this magnitude the issues would require subgroups and a plethora of experts working simultaneously to determine the best outcome. This scenario spoke of just two, rather than the possibility of tens or hundreds of “issues” that would need to be recognized. The process traits multiple people involved and experienced decision-makers go hand-in-hand. More people and more experiences can lead to too many options and no solutions if the options were not weighted and plotted in the manner used in this proposed model.

This simulation included an oversimplified example of the Decision-making actions. The actual use can become quite complex. The options can have several factors that give each of the choices weight, such as cost, time to enact, outcome of the options. In this example for ease of explanation only six options were given. It would not be unexpected to have several more. The models that represented the Decision-making Actions were the RM, MAUA, and the NGM.

For each of the three categories three separate models contributed thus verifying the complexity and the need for a single model. The new model proposed in this work is an option to be considered as a replacement for the current model, or as supplement to the NDM model, filling the gaps in crisis decision-making that the NDM model neglects.

Figure 9. More than one response/choice/option. The Situation Room white board was in use, they decision makers came up with five options (see Action 1).

Each member assigns a number value and the totals are tallied and ranked and plotted.

Decision-Making Actions:

1. **More than one response/choice/option**
2. All options are assigned a number based on value
3. Rank ordering or rating procedure results
4. Outcome decision based on a plot



If Khrushchev does not remove the missiles:

1. Invade Cuba
2. Invade Russia
3. Renegotiate
4. Send select troops to find the missiles
5. Nothing
6. Do A & B

**Figure 9 Multiple Options New Model in Action**

Figure 10. All options are assigned a number based on value. Each of the DMs assigned a number value on the options based on their preferences.



<p><u>Decision-Making Actions:</u></p> <ol style="list-style-type: none"> <li>1. More than one response/choice/option</li> <li>2. <b>All options are assigned a number based on value</b> →</li> <li>3. Rank ordering or rating procedure results</li> <li>4. Outcome decision based on a plot</li> </ol>	<p>If Khrushchev does not remove the missiles: (DM-Decision-maker)</p> <table border="0"> <thead> <tr> <th></th> <th>DM1</th> <th>DM2</th> <th>DM3</th> <th>DM4</th> <th>DM5</th> </tr> </thead> <tbody> <tr> <td>1. Invade Cuba</td> <td>1</td> <td>0</td> <td>1</td> <td>2</td> <td>2</td> </tr> <tr> <td>2. Invade Russia</td> <td>1</td> <td>0</td> <td>2</td> <td>1</td> <td>2</td> </tr> <tr> <td>3. Renegotiate</td> <td>3</td> <td>1</td> <td>2</td> <td>0</td> <td>2</td> </tr> <tr> <td>4. Send select troops to find the missiles</td> <td>2</td> <td>0</td> <td>3</td> <td>0</td> <td>3</td> </tr> <tr> <td>5. Nothing</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>6. Do A &amp; B</td> <td>1</td> <td>0</td> <td>2</td> <td>2</td> <td>3</td> </tr> </tbody> </table> <p style="text-align: right; margin-top: 10px;">Numbers represent choices by DMs.</p>		DM1	DM2	DM3	DM4	DM5	1. Invade Cuba	1	0	1	2	2	2. Invade Russia	1	0	2	1	2	3. Renegotiate	3	1	2	0	2	4. Send select troops to find the missiles	2	0	3	0	3	5. Nothing	0	0	0	0	1	6. Do A & B	1	0	2	2	3
	DM1	DM2	DM3	DM4	DM5																																						
1. Invade Cuba	1	0	1	2	2																																						
2. Invade Russia	1	0	2	1	2																																						
3. Renegotiate	3	1	2	0	2																																						
4. Send select troops to find the missiles	2	0	3	0	3																																						
5. Nothing	0	0	0	0	1																																						
6. Do A & B	1	0	2	2	3																																						

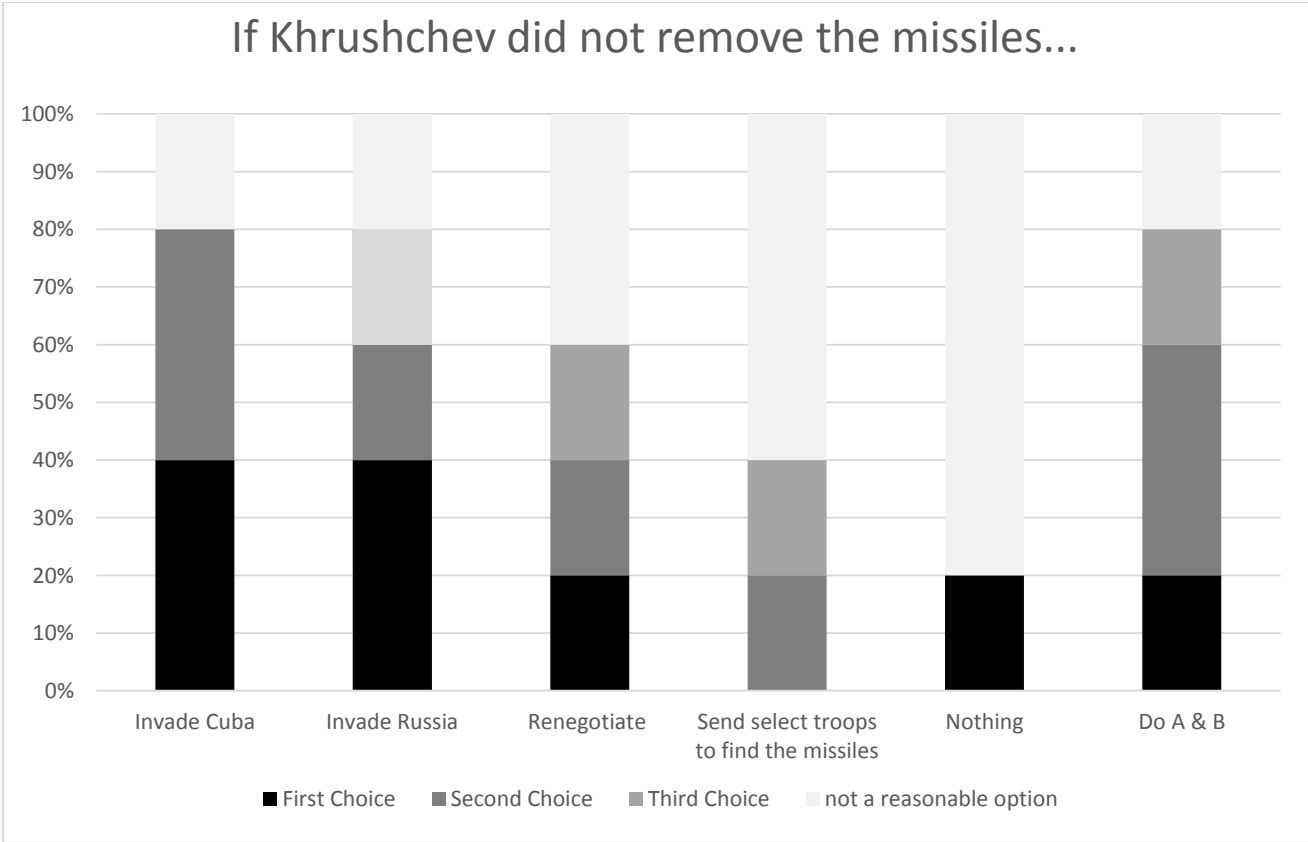
**Figure 10 Values Assigned, New Model in Action**

Figure 11. Rank ordering or rating procedure results. The values were rank ordered based on the preferences. The numbers represent how many decision makers picked that option as their first/second/third/no options.

<p><u>Decision-Making Actions:</u></p> <ol style="list-style-type: none"> <li>1. More than one response/choice/option</li> <li>2. All options are assigned a number based on value</li> <li>3. Rank ordering or rating procedure results</li> <li>4. Outcome decision based on a plot</li> </ol>	<p>If Khrushchev does not remove the missiles:</p> <ol style="list-style-type: none"> <li>1. Invade Cuba</li> <li>2. Invade Russia</li> <li>3. Renegotiate</li> <li>4. Send select troops to find the missiles</li> <li>5. Nothing</li> <li>6. Do A &amp; B</li> </ol>	<table border="0"> <thead> <tr> <th style="text-align: center;"><u>1<sup>st</sup></u></th> <th style="text-align: center;"><u>2<sup>nd</sup></u></th> <th style="text-align: center;"><u>3<sup>rd</sup></u></th> <th style="text-align: center;"><u>No</u></th> </tr> <tr> <th style="text-align: center;">Choice</th> <th style="text-align: center;">Choice</th> <th style="text-align: center;">Choice</th> <th style="text-align: center;">Choice</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> </tbody> </table>	<u>1<sup>st</sup></u>	<u>2<sup>nd</sup></u>	<u>3<sup>rd</sup></u>	<u>No</u>	Choice	Choice	Choice	Choice	2	2	0	1	2	3	0	1	1	1	1	2	0	1	1	3	1	0	0	4	1	2	1	1
<u>1<sup>st</sup></u>	<u>2<sup>nd</sup></u>	<u>3<sup>rd</sup></u>	<u>No</u>																															
Choice	Choice	Choice	Choice																															
2	2	0	1																															
2	3	0	1																															
1	1	1	2																															
0	1	1	3																															
1	0	0	4																															
1	2	1	1																															

Figure 11. Rank Ordering, The New Model in Use.

Figure 12. Outcome decision based on a plot. The options were plotted and the one with the most “first choice” or the most “first and second choice” are two ways to choose. Based on this simulation, if Khrushchev did not remove the missiles President Kennedy and his mock decision-makers will invade Cuba.



**Figure 12. Plot Outcome, the New Model in Use.**

## **Recommendations**

Recommendations for future work includes the adoption of the new model, testing of the new model by crisis leaders in simulations, and replication of study with a larger sample. Two of the sample models were not used by >80% of the crisis leaders so the replacement of the sample decision-making models could improve future work. Several of these shared processes are mentioned in the results section. Due to security restrictions, the professions of the individuals must remain private thus denying the exploration of the shared process between individuals and their positions. Future work would include finding a method to share this without divulging sensitive information.

With an increased sample size the variance or strength of one member's response would be minimized, and could open up to more correlation data. One of the subject experts from Iran shared the same profession as some of the US crisis leaders. The data might be interesting if this expert was measured up with their US counterparts in a larger study so the individuals could remain anonymous. The Black and the Delphi Models were used by <80% of the sample group of crisis experts. Future work may dictate that new models replace these decision-making models for other contexts as well. Following completion and receipt of the survey, a member check by telephone or email was conducted to ensure that participants understood the survey items. Performing a member check on the target populations of experts was important to check for accuracy of the responses (Fraenkel & Wallen, 2006). In future work an individual not affiliated with the work should perform this check.

The use of simulations was included in the literature review as of great benefit in preparing leaders for crisis situations. Future studies may include taking this new high-

stakes decision-making model and creating a scenario crisis event, and then use this model to make decisions to refine the model and decision processes.

## **Summary**

Three areas served as a foundation for this research, crisis leadership, factors contributing to crisis decision-making, and decision-making models. Research of the current literature revealed contextual factors affect the crisis decision-making and support the unique nature of crisis decision-making. The literature supported the assumption of this study that high-stakes crisis leaders must take into account unique contextual factors that other decision-makers may not address. A defining characteristic of crisis leadership is that these unique contextual factors put added pressure and stress on the leader and contribute to the “high stakes” aspect of crisis decision-making.

This study sprang from a hypothesis that high-stakes decision-making process traits are not adequately captured by current decision-making models. The hypothesis was tested by examining decision-making processes practiced by an expert panel of global, national, and local crisis leaders. Crisis leaders’ common decision-making process traits were analyzed, and the research suggested that no current decision-making model adequately captures the process of high-stakes decision-making by crisis leaders.

A potential new model for high-stakes decision-making was created from the survey responses of the expert crisis leaders. The results suggested the hypothesis was correct and points to a potential new model but further research with a larger sample would be needed to confirm this preliminary finding. Three categories best summarize the new model and the thirteen shared process traits used by the crisis leaders: Situational

awareness, group dynamics, and decision-making actions. This new crisis decision-making model will guide crisis leaders' high-stakes decision-making.

The decision-making model most frequently used in crises today is the Naturalistic Decision-making Model. It is a twenty-five year old model with limitations. The model did contribute five of the thirteen process traits in the new model. However, the NDM model relies on the expertise and instincts of the decision-maker, and does not address new situations, or assist new crisis leaders in making decisions. A new model seems warranted and this study proposed a new model for high-stakes decision-making that has the potential to guide a leader to attend to important process categories in making decisions and raise their awareness of the influencing factors unique to crises situations. Adoption of this new model will contribute to better decision-making for current and future leaders involved in High Stakes Crisis Decision-making.



## References

- Allison, G. T., & Zelikow, P. (1999). *Essence of decision: Explaining the cuban missile crisis* Longman New York, NY: Longman
- Aly, A. (in press). Brothers, believers, brave mujahideen: Focusing attention on the audience of violent jihadist preachers. *Studies in Conflict & Terrorism*
- Benini, A. A. (1993). Simulation of the effectiveness of protection and assistance for victims of armed conflict (sepavac): An example from mali, west africa. *Journal of Contingencies & Crisis Management*, 1(4), 215. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=rkh&AN=10478623&site=eds-live>
- Bernstein, B. J. (1986). A postwar myth: 500,000 US lives saved. *Bulletin of the Atomic Scientists*, 42(6), 38-40.
- Bigley, A. L. (2013). Horn's curve estimation through multi-dimensional interpolation. *Air Force Inst of Tech Wright-Patterson AFB OH Graduate School of Engineering and Management. Dayton, Ohio*
- Black, D. (1948). On the rationale of group decision-making. *The Journal of Political Economy*, 56(1)(23)

- Brown, B. B. (1968). *Delphi Process: A Methodology used for the Elicitation of Opinions of Experts*. Washington, DC: The Rand Corporation.
- Bullough, K. (1987). Two views of the nuclear confrontation. *Bulletin of Peace Proposals*, 18(1), 81. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=24h&AN=26782200&site=eds-live>
- Cantrill, J., Sibbald, B., & Buetow, S. (1996). The delphi and nominal group techniques in health services research. *International Journal of Pharmacy Practice*, 4(2), 67-74.
- Cartwright, D. (2008). Achieving change in people: Some applications of group dynamics Theory1. *Group Facilitation*, (9), 59.
- Cervone, H. F. (2009). Applied digital library project management: Using pugh matrix analysis in complex decision-making situations. *OCLC Systems & Services: International Digital Library Perspectives*, 25(4), 228-232.
- Committee on Homeland Security. (2015). Terrorist combating travel foreign fighter; final report of the task force on combating terrorist and foreign fighter travel. *Committee on Homeland Security House of Representatives*

- Costello, A. B., & Osborne, J. W. (2003). Exploring best practices in factor analysis: Four mistakes applied researchers make. Paper presented at the *American Educational Research Association Annual Meeting, Chicago, IL*,
- Cowan, K. C., & Rossen, E. (2013). Responding to the unthinkable: School crisis response and recovery. *Phi Delta Kappan*, 95(4), 8.
- Dalkey, N., & Helmer, O. (1963). An experimental application of the delphi method to the use of experts. *Management Science*, 9(3), 458-467.
- Dane, E., & Pratt, M. G. (2007). Exploring intuition and its role in managerial decision making. *Academy of Management Review*, 32(1), 33-54.
- Delp, P., Thesen, A., Motiwalla, J., & Seshadri, N. (1977). Delphi: System tools for project planning  
. *National Center for Research in Vocational Education, Ohio State University*, , 45-56.
- Drake, D. H., & Walters, R. (2015). 'Crossing the line': Criminological expertise, policy advice and the 'quarrelling society'. *Critical Social Policy*, 35(3), 414-433.  
doi:10.1177/0261018315589448

- Dye, K. C., Eggers, J. P., & Shapira, Z. (2014). Trade-offs in a tempest: Stakeholder influence on hurricane evacuation decisions. *Organization Science*, 25(4), 1009-1025. doi:10.1287/orsc.2013.0890
- Eckel, C. C., & Grossman, P. J. (2008). Men, women and risk aversion: Experimental evidence. *Handbook of Experimental Economics Results*, 1, 1061-1073.
- Eisenhardt, K. M., & Zbaracki, M. J. (1992). Strategic decision making. *Strategic Management Journal*, 13(S2), 17-37.
- Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois III, L. J. (1997). Conflict and strategic choice: How top management teams disagree. *California Management Review*, 39(2), 42. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edb&AN=9706245713&site=eds-live>
- Elbanna, S. (2006). Strategic decision-making: Process perspectives. *International Journal of Management Reviews*, 8(1), 1-20.
- Elbanna, S., & Child, J. (2007). Influences on strategic decision effectiveness: Development and test of an integrative model. *Strategic Management Journal*, 28(4), 431-453.

- Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, 4(3), 272.
- Festa, A., D'Agostino, R., Jr, Howard, G., Mykkanen, L., Tracy, R. P., & Haffner, S. M. (2000). Chronic subclinical inflammation as part of the insulin resistance syndrome: The insulin resistance atherosclerosis study (IRAS). *Circulation*, 102(1), 42-47.
- Finel, B. I., & Lord, K. M. (1999). The surprising logic of transparency. *International Studies Quarterly*, 43(2), 325-339.
- Fink, A., Kosecoff, J., Chassin, M., & Brook, R. H. (1984). Consensus methods: Characteristics and guidelines for use. *American Journal of Public Health*, 74(9), 979-983.
- Fraenkel, J., & Wallen, N. (2006). *How to design and evaluate research in education*. New York, NY: McGraw-Hill.
- French, J. R., Raven, B., & Cartwright, D. (1959). The bases of social power. *Classics of Organization Theory*, , 311-320.
- Galloway, S., Koch-Baumgarten, S., Voltmer, K., Goldhaber-Fiebert, S., Howard, S. K., & McGarity, T. O. (2002). *Theoretical cognitive differences in expert and novice*

*outdoor leader decision making: Implications for training and development* Journal of Adventure Education and Outdoor Learning, 2(1), 19-28

Garran, C., Christopher\_S.\_Garran@mcpsmd.org. (2013). A death at school: What school leaders should do. *Phi Delta Kappan*, 95(4), 18-22. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eft&AN=92743965&site=eds-live>

Gheytanchi, A., Joseph, L., Gierlach, E., Kimpara, S., Housley, J., Franco, Z. E., & Beutler, L. E. (2007). The dirty dozen: Twelve failures of the hurricane katrina response and how psychology can help. *American Psychologist*, 62(2), 118.

Gordon, C., & Arian, A. (2001). Threat and decision making. *Journal of Conflict Resolution*, 45(2), 196-215.

Grint, K. (2005). *Leadership: Limits and possibilities*. Longwood, England: Palgrave Macmillan.

Hammond, K. R., McClelland, G. H., & Mumpower, J. (1980). *Human judgment and decision making: Theories, methods, and procedures* JSTOR.

Hart, P., Rosenthal, U., & Kouzmin, A. (1993). Crisis decision making the centralization thesis revisited. *Administration & Society*, 25(1), 12-45.

- Heddleston, G. W. (2015). The use of the media as a weapon of mass psychological destruction. *Weapons of Mass Psychological Destruction and the People Who use Them*. In L. James & T. Oroszi (Eds.) (2016) *Weapons of mass psychological destruction and the people who use them* (39-49). Santa Barbara, CA: Praeger Press
- Hendricks, J. E., & Hendricks, C. S. (2014). *Crisis intervention in criminal justice/social service* Charles C Thomas Publisher.
- Herek, G. M., Janis, I. L., & Huth, P. (1987). Decision making during international crises is quality of process related to outcome? *Journal of Conflict Resolution*, 31(2), 203-226.
- Hermann, M. G., & Hagan, J. D. (1998). International decision making: Leadership matters. *Foreign Policy*, , 124-137.
- Holt, T., Freilich, J. D., Chermak, S., & McCauley, C. (2015). Political radicalization on the internet: Extremist content, government control, and the power of victim and jihad videos. *Dynamics of Asymmetric Conflict*, 8(2), 107-120.
- Horton, J. (1980). Nominal group technique. *Anaesthesia*, 35(8), 811-814.
- Horton, M., Rogers, P. S., Austin, L., & McCormick, M. (1991). Exploring the impact of face-to-face collaborative technology on group writing. *Journal of Management Information Systems*, 8(3), 27. Retrieved from

[http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?  
direct=true&db=edb&AN=5748177&site=eds-live](http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edb&AN=5748177&site=eds-live)

Janis, I. & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice and commitment*. Washington, DC: The Free Press

James, L. C., & Oroszi, T. L. (Eds.). (2015). *Weapons of mass psychological destruction and the people that use them*. Santa Barbara, Ca: Praeger Press.

Janis, I. (1991). Victims of groupthink. *Political Psychology*, 12(2), 247-278

Janis, I. L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. Washington, DC: Free Press.

Klein, G. (2008). Naturalistic decision making. *Human Factors*, 50(3), 456-460.

Klein, G. & Klinger, D. (1991). Naturalistic decision making. *Human Systems IAC Gateway*, 11(3), 16-19.

Klein, G., & Calderwood, R. (1991). Decision models: Some lessons from the field. *Systems, Man and Cybernetics, IEEE Transactions On*, 21(5), 1018-1026.

Klein, G., & Calderwood, R. (1996). *Investigations of Naturalistic Decision Making and the Recognition-Primed Decision Model*. Army Research Institute (ARI Note 96-43)  
1-27



Knecht, T., & Weatherford, M. S. (2006). Public opinion and foreign policy: The stages of presidential decision making. *International Studies Quarterly*, 50(3), 705-727.

Koopman, C. (1997). Political psychology as a lens for viewing traumatic events. *Political Psychology*, 18(4), 831-847.

Kubany, E. S. (1994). A cognitive model of guilt typology in combat-related PTSD. *Journal of Traumatic Stress*, 7(1), 3-19.

Kupchan, C. (1994). *The vulnerability of empire*. Ithaca, NY: Cornell University Press

Levy, J. K., Hartmann, J., Li, K. W., An, Y., & Asgary, A. (2007). Multi-Criteria decision support systems for flood hazard mitigation and emergency response in urban Watersheds<sup>1</sup>. *JAWRA Journal of the American Water Resources Association*, 43(2), 346-358.

Levy, J. K., Hipel, K. W., Howard, N., & Astorino-Courtois, A. (2009). *Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation* Springer Science & Business Media B.V. doi:10.1007/s10726-008-9145-7

Lin, Y., Lee, P., Chang, T., & Ting, H. (2008). Multi-attribute group decision making model under the condition of uncertain information. *Automation in Construction*, 17(6), 792-797.

- Low, L. L. (2008). You don't know what you don't know: Choices for school administrators when crisis hits. *Educational Leadership and Administration: Teaching and Program Development*, 20, 101-108. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ965143&site=eds-live>
- Mezley, G. (2004). Crisis management decision making. *Miklós Zrínyi National Defense University, Budapest, Hungary, AARMS SECURITY Vol. 3, No. 2 (2004) 267–288, 267–288.*
- Mishra, A. K. (1996). Organizational responses to crisis. *Trust in Organizations. Frontiers of Theory and Research*, , 261-287.
- Mukaka, M. (2012). A guide to appropriate use of correlation coefficient in medical research. *Malawi Medical Journal*, 24(3), 69-71.
- Northouse, P. G. (2015). *Leadership: Theory and practice*. Thousand Oaks, Ca: Sage Publications.
- Osborne, J. W., & Costello, A. B. (2004). Sample size and subject to item ratio in principal components analysis. *Practical Assessment, Research & Evaluation*, 9(11), 8.

Paton, D. (2006). Critical incident stress risk in police officers: Managing resilience and vulnerability. *Traumatology, 12*(3), 198-206.

Pauchant, T. C., & Douville, R. (1993). Recent research in crisis management: A study of 24 authors' publications from 1986 to 1991. *Organization & Environment, 7*(1), 43-66.

Pauchant, T. C., & Mitroff, I. I. (1992). *Transforming the crisis-prone organization: Preventing individual, organizational, and environmental tragedies*. San Francisco, CA: Jossey-Bass.

Pearson, C. M., & Clair, J. A. (1998). Reframing crisis management. *Academy of Management Review, 23*(1), 59-76.

Perrewé, P. L., Halbesleben, J. R., & Rosen, C. C. (2012). *The role of the economic crisis on occupational stress and well-being*. West Yorkshire, England: Emerald Group Publishing.

Pfeffer, J. (1981). *Power in organizations*. Marshfield, MA: Pitman Publishing.

Pfeffer, J. (1992). *Managing with power: Politics and influence in organizations*. Boston, MA: Harvard Business Press.

- Preti, A. (2008). School shooting as a culturally enforced way of expressing suicidal hostile intentions. *The Journal of the American Academy of Psychiatry and the Law*, 36(4), 544-550. doi:36/4/544 [pii]
- Qualtrics. (2005). (April 2016 ed.). Provo, Utah, USA:
- Ramser, P. (1993). *Review of decision making in action: Models and methods*. American Psychological Association.
- Rosenthal, U., & Kouzmin, A. (1997). Crises and crisis management: Toward comprehensive government decision making. *Journal of Public Administration Research and Theory*, 7(2), 277-304.
- Roth, R., Field, F., & Clark, J. (1994). Materials selection and multi-attribute utility analysis. *Journal of Computer-Aided Materials Design*, 1(3), 325-342.
- Saad, M. B. (2013). *The global hunger crisis: Tackling food insecurity in developing countries*. London, England: Pluto Press.
- Salancik, G. R., & Pfeffer, J. (1978). A social information processing approach to job attitudes and task design. *Administrative Science Quarterly*, , 224-253.
- Sanayei, A., Mousavi, S. F., Abdi, M., & Mohaghar, A. (2008). An integrated group decision-making process for supplier selection and order allocation using multi-

attribute utility theory and linear programming. *Journal of the Franklin Institute*, 345(7), 731-747.

Sayegh, L., Anthony, W. P., & Perrewé, P. L. (2004). Managerial decision-making under crisis: The role of emotion in an intuitive decision process. *Human Resource Management Review*, 14(2), 179-199.

Schaafstal, A. M., Johnston, J. H., & Oser, R. L. (2001). Training teams for emergency management. *Computers in Human Behavior*, 17(5-6), 615-626. doi:10.1016/S0747-5632(01)00026-7

Schofield, M. (1989). Exercises in diplomacy: Simulating future crises. *Futurist*, 23, 8-11. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eft&AN=504568743&site=eds-live>

Schwarz, N., & Oyserman, D. (2001). Asking questions about behavior: Cognition, communication, and questionnaire construction. *American Journal of Evaluation*, 22(2), 127-160.

Simon, H. (1976). *Administrative behavior: A study of decision-making processes in administrative organizations*. New York, NY: The Free Press

Simon, H. (1977). *The new science of management decision*. Upper Saddle Rivers, NJ: Prentice Hall.

Simon, H. A. (1972). Theories of bounded rationality. *Decision and Organization*, 1(1), 161-176.

Sinclair, M., & Ashkanasy, N. M. (2005). Intuition myth or a decision-making tool? *Management Learning*, 36(3), 353-370.

Singer, J. D. (1984). Negotiations, initiatives, and arms reductions. *Security Dialogue*, 15(4), 317-320.

Smart, C., & Vertinsky, I. (1977). Designs for crisis decision units. *Administrative Science Quarterly*, , 640-657.

Smith, K., & Hancock, P. A. (1995). Situation awareness is adaptive, externally directed consciousness. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 37(1), 137-148.

Snow, J. (2011). *The complete research suite: A step-by-step guide to using qualtrics*. Provo, Utah

Snyder, G. H. (1971). " Prisoner's dilemma" and" chicken" models in international politics. *International Studies Quarterly*, 15(1), 66-103.

- Snyder, G. H., & Diesing, P. (2015). *Conflict among nations: Bargaining, decision making, and system structure in international crises* Princeton University Press.
- Sobradelo, R., Martí, J., Kilburn, C., & López, C. (2015). Probabilistic approach to decision-making under uncertainty during volcanic crises: Retrospective application to the el hierro (spain) 2011 volcanic crisis. *Natural Hazards*, 76(2), 979-998.
- Suedfeld, P., & Tetlock, P. (1977). Integrative complexity of communications in international crises. *Journal of Conflict Resolution*, 21(1), 169-184.
- Sun, L. G., & Jones, R. A. (2012). Disaggregating disasters. *UCLA L.Rev.*, 60, 884.
- Tarar, A., & Leventoglu, B. (2009). Public commitment in crisis bargaining. *International Studies Quarterly*, 53(3), 817-839. doi:10.1111/j.1468-2478.2009.00557.x
- Thompson, S., & Kyle, K. (2005). Understanding mass school shootings: Links between personhood and power in the competitive school environment. *Journal of Primary Prevention*, 26(5), 419-438.
- Trump, K. S. (2015). Crisis communications in a digital world. *Educational Leadership*, 72(7), 74-78. Retrieved from <http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=voh&AN=102241647&site=eds-live>

- Turpin, S., & Marais, M. (2006). Decision-making: Theory and practice. *ORiON: The Journal of ORSSA*, 20(2), 143-160.
- Van de Ven, Andrew H, & Delbecq, A. L. (1974). The effectiveness of nominal, delphi, and interacting group decision making processes. *Academy of Management Journal*, 17(4), 605-621.
- Vinson, K. V., Costanzo, M. A., Berger, D. E., & Rich, E. C. (2009). *Predictors of verdict and punitive damages in high-stakes civil litigation* John Wiley & Sons, Inc. doi:10.1002/bsl.807
- Vroom, V. H., & Yetton, P. W. (1973). *Leadership and decision-making*. Pittsburgh, Pa: University of Pittsburgh Press
- Watkins, D., Yourish, K. & Giratikanon, T. (2016). Where ISIS has directed and inspired attacks around the world. Retrieved from [http://www.nytimes.com/interactive/2015/06/17/world/middleeast/map-isis-attacks-around-the-world.html?\\_r=0](http://www.nytimes.com/interactive/2015/06/17/world/middleeast/map-isis-attacks-around-the-world.html?_r=0)
- Wei, J., Zhao, D., & Liang, L. (2009). Estimating the growth models of news stories on disasters. *Journal of the American Society for Information Science & Technology*, 60(9), 1741. doi:10.1002/asi.21109



Weimann, G. (2011). Cyber- fatwas and terrorism. *Studies in Conflict & Terrorism*, 34(10), 765-781. doi:10.1080/1057610X.2011.604831

Welch, D. A., & Helfstein, S. (2012). *Crisis decision making reconsidered* Retrieved from

<http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ahl&AN=4566170&site=eds-live;>

<http://ezproxy.libraries.wright.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=edswss&AN=000305991200004&site=eds-live>

Widaman, K. F. (1993). Common factor analysis versus principal component analysis: Differential bias in representing model parameters? *Multivariate Behavioral Research*, 28(3), 263-311.

## **APPENDIX A**

### **SYSTEMATIC REVIEW PROCESS**

A systematic literature review was conducted to answer research questions one and two. This process limited researcher bias and demonstrated an extensive search of the literature. The literature search keywords included measures of decision-making and alternate phrasing of decision-making. The search included influencing factors related to high-stakes, crisis decision-making, such as politics, psychology, terrorism, and weapons of mass destruction or WMD. The advanced search was completed through the use of the Wright State University Library database. Decision-making and alternate wording of decision-makings, such as group decision-making, group decision-making process, collaborative decision-making, and group decision-making techniques. “High-stakes” or “crisis” was used in each of the twenty-one group searches. The filter “peer-reviewed articles” was applied to each search.

The outcome of the keyword searches in the twenty-one subgroup searches was a list of one hundred and twenty-six journal articles. Of the one hundred and twenty-six journal articles, seventy-nine were found in duplicate, triplicate, or more. After a cursory search of the articles, the author identified four articles that did not align with the mission of the research and omitted them. The repeated articles defined the outline of the literature review. The remaining articles provided additional background information. Occasionally a key article was cited that was excluded from the original filtered list, and was, after significant consideration, included due to its value to the research. The advanced search model was filtered to find the only peer-reviewed

articles; books were omitted. Due to this omission book contributions to the literature review were in addition to the original search.

Relevant words most commonly found in crisis and high-stakes literature were placed in subgroups and searched using a university library database. The main key word(s) for each subgroup (1-21) included decision-making or alternate wording of decision-making, such as group decision-making, group decision-making process, collaborative decision-making, or group decision-making techniques. The phrases high-stakes or crisis were used in each of the twenty-one group searches. The remaining key words included measures of decision-making, alternate phrasing, and influencing factors related to high-stakes, crisis decision-making, such as politics, psychology, terrorism, or weapons of mass destruction or WMD. Each key word was connected by AND Boolean operator, decreasing the search results with each aspect of the question. An example of a subgroup and search terms would be “decision-making” AND “high-stakes” AND “crisis”. The results of each subgroup can be found in gray. The filter “peer-reviewed articles” was applied to each search. The outcome was a list of one hundred and twenty-six journal articles. Of the one hundred and twenty-six journal articles seventy-eight were found in duplicate, triplicate, or more. After a cursory search of the articles, the author identified four articles that did not align with the mission of the research and omitted them. The articles found more than one time in the results established the outline of the literature review. The remaining articles provided additional background information. Occasionally a key article was cited that was excluded from the filtered list and was, after great consideration, included. Key points can be made, about other complex decision-making articles that were not part of the crisis or high-

stakes decisions, but still valuable to this work. The number in parenthesis identifies the number of articles from the subgroup that was also found in at least one other subgroup. This method identifies how well dispersed the duplicated articles overall. It identifies key researchers in the field such as Dr. Kevin Li, Ph.D. Two of his articles showed up a total of twelve times. This method identified potential gaps in the research with low yield numbers or non-repeating articles. It appears that terrorism, CBRN, and weapons of mass destruction research related to decision-making, crisis, and other relevant search terms.

Systematic Literature Review

1	<b>decision-making</b>	1,168,255	10	<b>decision-making</b>	1,470,309
	high-stakes	2,140		crisis or disaster or emergency	53959
	crisis or crisis management	18 (12)		medicine	11138
				high-stakes	11 (3)
2	<b>decision-making</b>	1,470,309		<b>Group decision-making</b>	228,906
	high-stakes	2,140	11	high-stakes	348
	models	490		crisis	4 (3)
	crisis	8 (7)			
3	<b>decision-making</b>	1,470,309	12	<b>Group decision-making</b>	228,906
	high-stakes	2,140		emergency	5,261
	international	248		crisis	331
	crisis	5 (3)		models	3
				high-stakes	3 (2)
4	<b>decision-making</b>	1,470,309		<b>Group decision-making</b>	228,906
	emergency	29,711	13	high-stakes	348
	crisis	1966		crisis	4
	international	380		international	0 (0)
	conflict	17 (6)			
5	<b>decision-making</b>	1,470,309	14	<b>Group decision-making</b>	228,906
	crisis	20660		crisis or disaster or emergency	8,533
	international	6122		high-stakes	11 (10)
	conflict	1476			
	model	342		<b>Collaborative decision-making</b>	23,927
	emergency	7 (6)	15	high-stakes	43
				crisis or disaster or emergency	3 (1)
6	<b>decision-making</b>	1,470,309		<b>group decision-making process</b>	102813
	crisis	20660		high-stakes	170
	international	6122	16		
	conflict	1476			

	model	342		crisis or disaster or emergency	7 (6)
	terrorism	6 (0)			
			17	<b>group decision-making process</b>	102813
7	<b>decision-making</b>	1,470,309		high-stakes	170
	crisis	20660		crisis management	2 (2)
	international	6122			
	conflict	1476	18	<b>group decision-making process</b>	102813
	model	342		high-stakes	170
	cbrn	0 (0)		government policy	8 (6)
			19	<b>group decision-making process</b>	102813
8	<b>decision-making</b>	1,470,309		high-stakes	170
	crisis	20660		military	2 (0)
	international	6122			
	conflict	1476	20	<b>group decision-making techniques</b>	20536
	model	342		high-stakes	14
	WMD or weapons of mass destruction	2 (0)		crisis or disaster or emergency	1(1)
9	<b>decision-making</b>	1,470,309	21	<b>Group decision-making</b>	228,906
	high-stakes	2,140		power	14306
	crisis or disaster or emergency	136		high-stakes	10 (3)
	psychology	11			
	models	7 (6)			

*Note.* Filtered selection for peer-reviewed journal articles only. Gray areas represent results from subgroup search. The (x) represents the number of repeated articles.

Table 12 Systematic Literature Review

*Authors from Literature Search Appearing Multiple Times.*

# Articles	Authors (year)
10	Levy, J. K., Hipel, K. W., & Howard, N. (2009).
6	Li, K. W., Levy, J. K., & Buckley, P. (2009).
5	McGarity, T. O. (2012).
4	Dye, K. C., Eggers, J. P., & Shapira, Z. (2014).
4	House, A., Power, N., & Alison, L. (2014).
3	Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois III, L. J. (1997).
3	Galloway, S. (2002).
3	Hayes, P. A. J., & Omodei, M. M. (2011).
3	Kennedy, T. J. T., Regehr, G., Baker, G. R., & Lingard, L. A. (2009).
3	Mansell, J., Ota, R., Erasmus, R., & Marks, K. (2011).
3	Vinson, K. V., Costanzo, M. A., & Berger, D. E. (2008).
2	Anon (1977).
2	Benini, A. A. (1993).
2	Berndt, C. (2013).
2	Drake, D. H., & Walters, R. (2015).
2	Edwards, M., Goreaud, F., & Ferrand, N. (2008).
2	Kananen, I., Korhonen, P., Wallenius, J., & Wallenius, H. (1990).
2	Levy, J. K., Hartmann, J., Li, K. W., An, Y., & Asgary, A. (2007).
2	Regehr, C., Bogo, M., LeBlanc, V. R., Baird, S., Paterson, J., & Birze, A. (2016).
2	Roberto, M. A. (2002).
2	Scales, P. C., Roehlkepartain, E. C., Wallace, T., Inselman, A., Stephenson, P., & Rodriguez, M. (2015).
2	Tarar, A., & Leventoglu, B. (2009).
2	Wei, J., Zhao, D., & Liang, L. (2009).
2	Zagorecki, A. T., Johnson, D. E. A., & Ristvej, J. (2013).

*Note.* The authors that appeared more than one time in the systematic literature search are listed here, including the number of times the article appeared.

Table 13 Authors from Literature Review Appearing Multiple Times

## Repeated References from Systematic Literature Search

Sub group #	Title of Journal Article
1	Anon. (1977). Middle east impasse. <i>Atlas</i> , 10.
1	Drake, D. H., & Walters, R. (2015). 'Crossing the line': Criminological expertise, policy advice and the 'quarrelling society'. <i>Critical Social Policy</i> , 35(3), 414-433. doi:10.1177/0261018315589448
1	Edwards, M., Goreaud, F., & Ferrand, N. (2008). Simulating heterogeneity in a consumption model linked to a water resource model: When is the linear approximation relevant? <i>Simulation Modelling Practice &amp; Theory</i> , 16(1), 65-75. doi:10.1016/j.simpat.2007.10.003
1	Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois III, L. J. (1997). Conflict and strategic choice: How top management teams disagree. <i>California Management Review</i> , 39(2), 42.
1	Galloway, S., Koch-Baumgarten, S., Voltmer, K., Goldhaber-Fiebert, S., Howard, S. K., & McGarity, T. O. (2012). Theoretical cognitive differences in expert and novice outdoor leader decision-making: Implications for training and development <i>Journal of Adventure Education and Outdoor Learning</i> .
1	House, A., Power, N., & Alison, L. (2014). A systematic review of the potential hurdles of interoperability to the emergency services in major incidents: Recommendations for solutions and alternatives
1	Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. <i>Group Decision and Negotiation</i> , 18(4), 303-316. doi:10.1007/s10726-008-9145-7
1	Mansell, J., Ota, R., Erasmus, R., Marks, K., House, A., Power, N., & Alison, L. (2014). Reframing child protection: A response to a constant crisis of confidence in child protection. Netherlands: Elsevier Science. doi:10.1016/j.chilyouth.2011.04.019
1	McGarity, T. O. (2012). Administrative law as blood sport: Policy erosion in a highly partisan age
1	Regehr, C., Bogo, M., LeBlanc, V. R., Baird, S., Paterson, J., & Birze, A. (2016). Suicide risk assessment: Clinicians' confidence in their professional judgment. <i>Journal of Loss and Trauma</i> , 21(1), 30-46. doi:10.1080/15325024.2015.1072012
1	Vinson, K. V., Costanzo, M. A., & Berger, D. E. (2008). Predictors of verdict and punitive damages in high-stakes civil litigation. <i>Behavioral Sciences &amp; the Law</i> , 26(2), 167-186. doi:10.1002/bsl.807



- 1 Zagorecki, A. T., Johnson, D. E. A., Ristvej, J., Epstein, L., Ho, D. E., King,  
G., . . .
- 2 Edwards, M., Goreaud, F., & Ferrand, N. (2008). Simulating heterogeneity  
in a consumption model linked to a water resource model: When is the linear  
approximation relevant? *Simulation Modelling Practice & Theory*, 16(1), 65-  
75. doi:10.1016/j.simpat.2007.10.003
- 2 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory  
for managing global hazards and disasters. part I: Theoretical  
foundation. *Group Decision and Negotiation*, 18(4), 303-316.  
doi:10.1007/s10726-008-9145-7
- 2 House, A., Power, N., & Alison, L. (2014). A systematic review of the  
potential hurdles of interoperability to the emergency services in major  
incidents: Recommendations for solutions and alternatives
- 2 Galloway, S. (2002). Theoretical cognitive differences in expert and novice  
outdoor leader decision-making: Implications for training and  
development. *Journal of Adventure Education and Outdoor Learning*, 2(1),  
19-28.
- 2 Mansell, J., Ota, R., Erasmus, R., & Marks, K. (2011). Reframing child  
protection: A response to a constant crisis of confidence in child  
protection. *Children and Youth Services Review*, 33, 2076-2086.  
doi:10.1016/j.chilyouth.2011.04.019
- 2 McGarity, T. O. (2012). Administrative law as blood sport: Policy erosion in  
a highly partisan age
- 2 Vinson, K. V., Costanzo, M. A., Berger, D. E., House, A., Power, N., &  
Alison, L. (2008). Predictors of verdict and punitive damages in high-stakes  
civil litigation. United States: John Wiley And Sons. doi:10.1002/bsl.807
- 3 Anon (1977). Middle east impasse. *Atlas*, , 10.
- 3 Regehr, C., Bogo, M., LeBlanc, V. R., Baird, S., Paterson, J., & Birze, A.  
(2016). Suicide risk assessment: Clinicians' confidence in their professional  
judgment. *Journal of Loss and Trauma*, 21(1), 30-46.  
doi:10.1080/15325024.2015.1072012
- 3 Zagorecki, A. T., Johnson, D. E. A., & Ristvej, J. (2013). Data mining and  
machine learning in the context of disaster and crisis  
management. *International Journal of Emergency Management*, 9(4), 351-  
365. doi:10.1504/IJEM.2013.059879
- 4 Benini, A. A. (1993). Simulation of the effectiveness of protection and  
assistance for victims of armed conflict (sepavac): An example from mali,  
west africa. *Journal of Contingencies & Crisis Management*, 1(4), 215.
- 4 Berndt, C. (2013). Assembling market b/orders: Violence, dispossession, and  
economic development in ciudad Juárez, mexico. *Environment & Planning  
A*, 45(11), 2646-2662. doi:10.1068/a45690

- 4 Kananen, I., Korhonen, P., Wallenius, J., & Wallenius, H. (1990). Multiple  
objective analysis of input-output models for emergency  
management. *Operations Research*, 38(2), 193.
- 4 Scales, P. C., Roehlkepartain, E. C., Wallace, T., Inselman, A., Stephenson,  
P., & Rodriguez, M. (2015). Brief report: Assessing youth well-being in  
global emergency settings: Early results from the emergency developmental  
assets profile. *Journal of Adolescence*, 45, 98.  
doi:10.1016/j.adolescence.2015.09.002
- 4 Tarar, A., & Leventoglu, B. (2009). Public commitment in crisis  
bargaining. *International Studies Quarterly*, 53(3), 817-839.  
doi:10.1111/j.1468-2478.2009.00557.x
- 4 Wei, J., Zhao, D., & Liang, L. (2009). Estimating the growth models of news  
stories on disasters. *Journal of the American Society for Information Science  
& Technology*, 60(9), 1741. doi:10.1002/asi.21109
- 5 Benini, A. A. (1993). Simulation of the effectiveness of protection and  
assistance for victims of armed conflict (sepavac): An example from mali,  
west africa. *Journal of Contingencies & Crisis Management*, 1(4), 215.
- 5 Berndt, C. (2013). Assembling market b/orders: Violence, dispossession, and  
economic development in ciudad Juárez, mexico. *Environment & Planning  
A*, 45(11), 2646-2662. doi:10.1068/a45690
- 5 Kananen, I., Korhonen, P., Wallenius, J., & Wallenius, H. (1990). Multiple  
objective analysis of input-output models for emergency  
management. *Operations Research*, 38(2), 193.
- 5 Scales, P. C., Roehlkepartain, E. C., Wallace, T., Inselman, A., Stephenson,  
P., & Rodriguez, M. (2015). Brief report: Assessing youth well-being in  
global emergency settings: Early results from the emergency developmental  
assets profile. *Journal of Adolescence*, 45, 98.  
doi:10.1016/j.adolescence.2015.09.002
- 5 Tarar, A., & Leventoglu, B. (2009). Public commitment in crisis  
bargaining. *International Studies Quarterly*, 53(3), 817-839.  
doi:10.1111/j.1468-2478.2009.00557.x
- 5 Wei, J., Zhao, D., & Liang, L. (2009). Estimating the growth models of news  
stories on disasters. *Journal of the American Society for Information Science  
& Technology*, 60(9), 1741-1755. doi:10.1002/asi.21109
- 9 Galloway, S. (2002). Theoretical cognitive differences in expert and novice  
outdoor leader decision-making: Implications for training and  
development. *Journal of Adventure Education and Outdoor Learning*, 2(1),  
19-28.
- 9 House, A., Power, N., & Alison, L. (2014). A systematic review of the  
potential hurdles of interoperability to the emergency services in major

- incidents: Recommendations for solutions and alternatives. *Cognition, Technology & Work*, 16(3), 319-335. doi:10.1007/s10111-013-0259-6
- 9 Kennedy, T. J. T., Regehr, G., Baker, G. R., & Lingard, L. A. (2009). 'It's a cultural expectation.' the pressure on medical trainees to work independently in clinical practice. *Medical Education*, 43(7), 645-653. doi:10.1111/j.1365-2923.2009.03382.x
- 9 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision & Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 9 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security and energy security in the post-911 era: Group decision support for strategic policy analysis under conditions of conflict. *Group Decision & Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 9 Mansell, J., Ota, R., Erasmus, R., & Marks, K. (2011). Reframing child protection: A response to a constant crisis of confidence in child protection. *Children & Youth Services Review*, 33(11), 2076-2086. doi:10.1016/j.childyouth.2011.04.019
- 10 Drake, D. H., Walters, R., & Boulet, J. R. (2008). 'Crossing the line': Criminological expertise, policy advice and the 'quarrelling society' doi:10.1177/0261018315589448
- 10 Kennedy, T. J. T., Regehr, G., Baker, G. R., & Lingard, L. A. (2009). 'It's a cultural expectation.' the pressure on medical trainees to work independently in clinical practice. *Medical Education*, 43(7), 645-653. doi:10.1111/j.1365-2923.2009.03382.x
- 10 Vinson, K. V., Costanzo, M. A., Berger, D. E., & Rich, E. C. (2008). Predictors of verdict and punitive damages in high-stakes civil litigation John Wiley & Sons, Inc. doi:10.1002/bsl.807
- 11 Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois III, L. J. (1997). Conflict and strategic choice: How top management teams disagree. *California Management Review*, 39(2), 42.
- 11 House, A., Power, N., & Alison, L. (2014). A systematic review of the potential hurdles of interoperability to the emergency services in major incidents: Recommendations for solutions and alternatives
- 11 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision and Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 12 House, A., Power, N., & Alison, L. (2014). A systematic review of the potential hurdles of interoperability to the emergency services in major incidents: Recommendations for solutions and alternatives

- 12 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security and energy security in the post-911 era: Group decision support for strategic policy analysis under conditions of conflict. *Group Decision & Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 12 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision and Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 14 Dye, K. C., Eggers, J. P., & Shapira, Z. (2014). Trade-offs in a tempest: Stakeholder influence on hurricane evacuation decisions. *Organization Science*, 25(4), 1009-1025. doi:10.1287/orsc.2013.0890
- 14 Eisenhardt, K. M., Kahwajy, J. L., & Bourgeois III, L. J. (1997). Conflict and strategic choice: How top management teams disagree. *California Management Review*, 39(2), 42.
- 14 Hayes, P. A. J., & Omodei, M. M. (2011). Managing emergencies: Key competencies for incident management teams. *Australian & New Zealand Journal of Organisational Psychology*, 4(1), 1-10. doi:10.1375/ajop.4.1.1
- 14 House, A., Power, N., & Alison, L. (2014). A systematic review of the potential hurdles of interoperability to the emergency services in major incidents: Recommendations for solutions and alternatives
- 14 McGarity, T. O. (2012). Administrative law as blood sport: Policy erosion in a highly partisan age
- 14 Kennedy, T. J. T., Regehr, G., Baker, G. R., & Lingard, L. A. (2009). 'It's a cultural expectation. ' the pressure on medical trainees to work independently in clinical practice. *Medical Education*, 43(7), 645-653. doi:10.1111/j.1365-2923.2009.03382.x
- 14 Levy, J. K., Hartmann, J., Li, K. W., An, Y., & Asgary, A. (2007). Multi-criteria decision support systems for flood hazard mitigation and emergency response in urban watersheds. *Journal of the American Water Resources Association*, 43(2), 346-358. doi:10.1111/j.1752-1688.2007.00027.x
- 14 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision & Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 14 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security and energy security in the post-911 era: Group decision support for strategic policy analysis under conditions of conflict. *Group Decision & Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 14 Roberto, M. A. (2002). Lessons from everest: The interaction of cognitive bias, psychological safety, and system complexity. *California Management Review*, 45(1), 136-158.

- 15 House, A., Power, N., & Alison, L. (2014). A systematic review of the potential hurdles of interoperability to the emergency services in major incidents: Recommendations for solutions and alternatives
- 16 Dye, K. C., Eggers, J. P., & Shapira, Z. (2014). Trade-offs in a tempest: Stakeholder influence on hurricane evacuation decisions. *Organization Science*, 25(4), 1009-1025. doi:10.1287/orsc.2013.0890
- 16 Hayes, P. A. J., & Omodei, M. M. (2011). Managing emergencies: Key competencies for incident management teams. *Australian & New Zealand Journal of Organisational Psychology*, 4(1), 1-10. doi:10.1375/ajop.4.1.1
- 16 Levy, J. K., Hartmann, J., Li, K. W., An, Y., & Asgary, A. (2007). Multi-criteria decision support systems for flood hazard mitigation and emergency response in urban watersheds. *Journal of the American Water Resources Association*, 43(2), 346-358. doi:10.1111/j.1752-1688.2007.00027.x
- 16 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision & Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 16 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security and energy security in the post-911 era: Group decision support for strategic policy analysis under conditions of conflict. *Group Decision & Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 16 Roberto, M. A. (2002). Lessons from everest: The interaction of cognitive bias, psychological safety, and system complexity. *California Management Review*, 45(1), 136-158.
- 17 McGarity, T. O. (2012). Administrative law as blood sport: Policy erosion in a highly partisan age
- 17 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision and Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 18 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory for managing global hazards and disasters. part I: Theoretical foundation. *Group Decision and Negotiation*, 18(4), 303-316. doi:10.1007/s10726-008-9145-7
- 18 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security and energy security in the post-911 era: Group decision support for strategic policy analysis under conditions of conflict. *Group Decision & Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 18 McGarity, T. O. (2012). Administrative law as blood sport: Policy erosion in a highly partisan age

- 18 Paciotti, K. (2008). Listening to the voiceless: Student voices and  
democracy. *Teacher Education & Practice*, 21(2), 215-226.
- 18 Dye, K. C., Eggers, J. P., & Shapira, Z. (2014). Trade-offs in a tempest:  
Stakeholder influence on hurricane evacuation decisions. *Organization  
Science*, 25(4), 1009-1025. doi:10.1287/orsc.2013.0890
- 18 Hayes, P. A. J., & Omodei, M. M. (2011). Managing emergencies: Key  
competencies for incident management teams. *Australian & New Zealand  
Journal of Organisational Psychology*, 4(1), 1-10. doi:10.1375/ajop.4.1.1
- 20 Dye, K. C., Eggers, J. P., & Shapira, Z. (2014). Trade-offs in a tempest:  
Stakeholder influence on hurricane evacuation decisions. *Organization  
Science*, 25(4), 1009-1025. doi:10.1287/orsc.2013.0890
- 21 Levy, J. K., Hipel, K. W., & Howard, N. (2009). Advances in drama theory  
for managing global hazards and disasters. part I: Theoretical  
foundation. *Group Decision and Negotiation*, 18(4), 303-316.  
doi:10.1007/s10726-008-9145-7
- 21 Li, K. W., Levy, J. K., & Buckley, P. (2009). Enhancing national security  
and energy security in the post-911 era: Group decision support for strategic  
policy analysis under conditions of conflict. *Group Decision &  
Negotiation*, 18(4), 369-386. doi:10.1007/s10726-008-9147-5
- 21 House, A., Power, N., & Alison, L. (2014). A systematic review of the  
potential hurdles of interoperability to the emergency services in major  
incidents: Recommendations for solutions and alternatives

## APPENDIX B

### QUESTIONNAIRE PACKET

#### High-Stakes Decision-Making for Crisis Leadership

Date: April 1, 2016

Dear Subject Matter Expert,

You are being invited to participate in a research study and your participation will include completing a survey about *High stakes decision-making*. We ask that you offer some demographics to answer some simple statistics, possible correlations. You are part of a panel of experts include experts in first response, active threat, chemical, biological, radiological, and nuclear (CBRN) defense, and medical emergency.

Enclosed is a PDF fill-in form that relates to traits found in several decision-making models. You will choose the option that best describes this trait:

*Y = Yes, you use this trait in your high stakes/crisis decision-making.*

*N = No, you do not use this trait as part of the decision-making process, or*

*U = you are undetermined/undecided/unsure if you use this trait.*

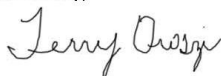
There are no known risks for your participation in this research study. Although the information collected may not benefit you directly, the material learned in this study may be helpful to others. The data you provide will aid in the creation of a crisis high stakes decision-making model that can be used for other complex decision-making. Your completed survey will be stored on a secure password protected laptop. The survey will take approximately *15 minutes* time to complete.

Individuals from the department of Pharmacology & Toxicology, the Institutional Review Board (IRB), Office of Research and Sponsored Programs and other regulatory agencies may inspect these records. In all other respects, however, the data will be held in confidence to the extent permitted by law. Should the data be published, your identity will not be disclosed.

Taking part in this study is voluntary. By completing this survey you agree to take part in this research study. You do not have to answer any questions that make you uncomfortable. You may choose not to take part at all. If you decide to be in this study you may stop taking part at any time. If you decide not to be in this study or if you stop taking part at any time, you will not lose any benefits for which you may qualify.

If you have any questions, concerns, or complaints about the research study, please contact: Terry Oroszi, 937-212-4576. If you have any questions about your rights as a research subject, you may call the Wright State IRB Office at (937) 775-4462. You can discuss any questions about your rights as a research subject with a member of the IRB or staff. The IRB is an independent committee made up of people from the University community, staff of the institutions, as well as people from the community not connected with these institutions. The IRB has reviewed this research study.

Sincerely,



Terry Oroszi, MS  
Post Doc Fellow, Advanced Clinical Simulations, VA Med. Center  
Director, MS Graduate Program  
Director, Chem Bio Rad Nuc (CBRN) Defense Program

This information will be shared with a screened group of approved members in a sensitive facility. Anonymity for the responders is of utmost importance to this group. This research has been approved by an institutional review board SC#6153, effective on April 1, 2016. We are asking that you complete the demographics section as well as the questionnaire. If you are unsure how to answer please look at the definitions section of this document. If you still need assistance please email: [terry.oroszi@wright.edu](mailto:terry.oroszi@wright.edu).

**Demographics of Crisis Leader: (optional)**

Name: \_\_\_\_\_ Age: \_\_\_\_\_

Gender: \_\_\_\_\_ Ethnicity: \_\_\_\_\_

City/State/Country: \_\_\_\_\_ Job Title: \_\_\_\_\_

Years in this field: \_\_\_\_\_

Job Description:

Additional comments that will aid in crisis decision-making. Examples could be real life scenarios, other tools or insightful advice for the novice crisis decision-maker.



## CRISIS DECISION-MAKING TRAITS

(Y - yes, I use in my decision making. N - no, I do not use in my decision making, or U - Undecided, I do not know if I use this trait)

- |  |  |
|--|--|
| <p><input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> All options are assigned a number based on value</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Assumes objective data</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Conditions continue to change</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Conversation &amp; debate</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Decision makers are experienced</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Decision-making is seen as a battle</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Decisions made by group without contact</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Discussion of the recorded ideas to clarify/evaluate</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Each option weighed and considered</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Focus on more than one issue at a time</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Formal process of analysis</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Goals defined by self interest</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> High stress environment</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Incrementalist approach, identifies weakness, not new ideas</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Internet needed</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Known objectives</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Member has the option to abstain</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> More than one response/choice/option</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Multiple rounds</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Multiple people involved</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Needed information is missing</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Needs of the members outweigh rationality</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> No face to face meetings</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> No time constraints</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Oral phase, sharing options without discussion</p> | <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Organizational goals exists</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Outcome decision based on plot</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Point system</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Power and influence weigh heavily on outcome</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Power is decentralized</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Preferred answer or answers</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Public choice theory, use of economic tools to analyze</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Quantitative Approach</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Rank ordering or rating procedure results</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Requires complete knowledge of information about alternatives</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Results are plotted</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Sequential questionnaires</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Silent independent voting by individuals</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Structure of organization influences outcome</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Structured, sitting around a table</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> The "group decision" is the pooled outcome of individual votes</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> The responses are shared with group prior to next round</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Time Constraints</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Time-consuming</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Undefined goals</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Unlimited resources to evaluate each choice</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Useful for everyday decisions</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Vote is anonymous</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Weighted Responses</p> <p><input type="radio"/> <input type="radio"/> <input type="radio"/> Writing phase, all the options on paper</p> |
|--|--|

To aid you in answering the questionnaire we have provided the following definitions of each trait.

Trait	Defined
All options are assigned a number based on value	When choosing the best option you use a point system to identify the best option/outcome.
Assumes objective data	When making a decision you assume all the data is objective, not subjective. Not one or more person's opinion.
Conditions continue to change	When making a decision you assume the conditions will change, so your goals are often in flux.
Conversation & debate	Conversation and debate are practiced when making decisions.
Decision makers are experienced	The assumption is that the majority of group members have expertise in making decisions
Decision-making is seen as a battle	Decisions are made with several loud opposing members. Conflict is visible.
Decisions made by group without contact	Decisions are often made via email or similar method without direct interaction with group members.
Discussion of the recorded ideas to clarify/evaluate	The group records the options (paper/audio/video) then after recording there is a verbal discussion of the recorded ideas to clarify/evaluate.
Each option weighed and considered	Weighted Responses/Rank ordering or rating procedure results. When a member has more than one favorite or least favorite option they can rank their responses with more than one favorite.
Focus on more than one issue at a time	Issues affecting the decision, all focused on one decision, not multiple decisions.
Formal process of analysis	The process to address decision-making options is a formal one
Goals defined by self interest	Goals are defined by the questions posed and how it affect the ones making the decisions.
High stress environment	The environment around the decision-making invokes a feeling of high stress/anxiety.
Incrementalist approach	Incrementalist approach. This approach identifies weakness, not new ideas. Small steps to make change, typically to change an existing decision, not make new ones.
Internet needed	Internet needed. The internet can be used to reach members not present, but is not required.
Known objectives	The objectives or goals are clearly defined prior to decision-making.
Member has the option to abstain	The members of the group have the option to abstain.
More than one response/choice/option	Several alternatives are given and members can pick more than one.
Multiple rounds	If a decision is made and not accepted the members reevaluate the problem.

Multiple people involved	Decision-making often involves more than two members.
Needed information is missing	The information needed to make an informed decision is not always complete.
Needs of the members outweigh rationality	The member's needs or goals outweigh the collective.
No face to face meetings	Decisions are made without being in the same room.
No time constraints	The decisions are made without time constraints.
Oral phase, sharing options without discussion	Members speak their ideas, solutions, or options aloud, but no discussion on the ideas, solutions, or options are included.
Organizational goals exists	The decision makers are part of a larger organization, with goals greater than the group.
Outcome decision based on plot	A plot is created based on outcomes, and the preferred option is derived from the plot analysis.
Point system	Points are assigned to each option and the points determine the preference.
Power and influence weigh heavily on outcome	Decisions are often made with the highest ranking people having more influence.
Power is decentralized	Although there are varying ranks and positions in the decision-making group every member has equal vote.
Preferred answer or answers	The decision-making process includes preferred answers.
Use of economic tools to analyze	Through the use of math the relationship between two or more variables/options are examined.
Quantitative Approach	Results are assigned numbers and assessed.
Rank ordering or rating procedure results	The options are assigned from best to worst.
Requires complete knowledge of information about alternatives	When decision-making all alternatives are explored and thoroughly examined before making a decision.
Results are plotted	Results are plotted and based on the outcome decisions are made.
Sequential questionnaires	Through the use of a questionnaire and multiple rounds (as many as needed) decisions are made.
Silent independent voting by individuals	No discussion on topic before/during/after vote. Similar to anonymous ballot.
Structure of organization influences outcome	The overarching goals of the organization influence the action of the decision makers.
Structured, sitting around a table	Traditional conference room setting, face to face.
The "group decision" is the pooled outcome of individual votes	The decision-makers make decisions individually, then the decisions are pooled and decided as a group.
The responses are shared with group prior to next round	Transparency is important to the decision making as they progress through the problem.

Time constraints	Decisions must be made with a limited amount of time.
Time-consuming	The decision making process involves takes more time than members would like.
Undefined goals	Decisions are made without defining the goals.
Unlimited resources to evaluate each choice	The decision-makers have unlimited resources to evaluate each choice or option.
Useful for everyday decisions	Your decision making process is used for crisis and non-crisis decisions.
Vote is anonymous	Members are not informed on others' decisions.
Weighted Responses	The options are weighted based on preference, person presenting the options, or other method.
Writing phase, all the options on paper	One or all of the options are presented, analyzed, completed on paper.

## **Subject Informed Consent Document**

### **TITLE OF RESEARCH STUDY**

Investigator(s) name & address: **Terry Oroszi, Pharmacology & Toxicology**

Site(s) where study is to be conducted: **questionnaire (electronically submitted)**

Phone number for subjects to call for questions: **937-212-4576**

### **Introduction and Background Information**

You are invited to participate in a research study. The study is being conducted by Terry Oroszi, M.S. Approximately **10** subjects will be invited to participate.

### **Purpose**

The purpose of this study is to develop a new crisis decision making model. Through the use of the questionnaire, interviews, and Q-sort analysis the working hypothesis that a new crisis decision-making model is needed will be explored. The current Naturalistic Model may be appropriate for some crisis decision-making, but not all. The new model created will represent the most valuable traits and validated by a team of experts. This model may be applied to other complex decision-making.

The goal of the model includes gathering valuable input from all of the decision-makers at the table, so the decision-making is more informed while representing the whole team. This model can aid not only in defining a process of decision-making but also facilitate debriefing to determine what worked in a situation, and what went wrong.

### **Procedures**

In this study, you will be asked to respond to questionnaire that includes 48 traits. The subject will respond with a Y – yes, I use this in my crisis decision making, N – no, I do not use this trait in crisis decision making, or U – undecided, I may or may not use this trait. The questionnaire will be followed up with an interview to ensure the subject understand the questionnaire, to point out and strengths or weaknesses in the questionnaire.

### **Potential Risks**

There are no foreseeable risks for the subjects.

### **Benefits**

The possible benefits of this study include creating a decision making model for crisis leaders that can be used for other complex decision making as well as post conflict/decision debriefing. The information collected may not benefit you directly. The information learned in this study may be helpful to others.

### **Compensation i**

You will not be compensated for your time, inconvenience, or expenses while you are in this study.

### **Confidentiality**

Total privacy cannot be guaranteed. We will protect your privacy to the extent permitted by law. If the results from this study are published, your name will not be made public. Once your information leaves our institution, we cannot promise that others will keep it private.

Your information may be shared with the following:

- The Wright State IRB and Office of Research and Sponsored Programs

### **Security**

Results from the questionnaire will be kept in a password protected computer.

### **Conflict of Interest (if study is externally sponsored)**

NA

### **Voluntary Participation**

Taking part in this study is voluntary. You may choose not to take part at all. If you decide to be in this study you may stop taking part at any time. If you decide not to be in this study or if you stop taking part at any time, you will not lose any benefits for which you may qualify.

You will be told about any changes that may affect your decision to continue in the study.

### **Research Subject's Rights, Questions, Concerns, and Complaints**

You may contact the principal investigator at [937-212-4576](tel:937-212-4576).

If you have any questions about your rights as a study subject, questions, concerns or complaints, you may call the Wright State IRB Office (937) 775-4462. You may discuss any questions about your rights as a subject with a member of the IRB or staff. The IRB is an independent committee composed of members of the University community, staff of the institutions, as well as lay members of the community not connected with these institutions. The IRB has reviewed this study.

---

This paper tells you what will happen during the study if you choose to take part. Your signature means that this study has been discussed with you, that your questions have been answered, and





## APPENDIX C

### IRB PETITION APPROVAL LETTER



Office of Research and Sponsored Programs  
201J University Hall  
3640 Col. Glenn Hwy.  
Dayton, OH 45435-0001  
(937) 775-2425  
(937) 775-3781 (FAX)  
e-mail: rsp@wright.edu

**DATE:** April 01, 2016  
**TO:** Terry Oroszi, M.S., Research Instructor  
Pharmacology & Toxicology  
**FROM:** Robyn Wilks, CIM *RW*  
Coordinator, WSU-IRB  
**SUBJECT:** SC# 6153  
*'High-Stakes Decision-Making for Crisis Leadership'*

This memo is to verify the receipt and acceptance of your response to the conditions placed on the above referenced human subjects protocol/amendment.

These conditions were lifted on: 04/01/2016

This study/amendment now has full approval and you are free to begin the research project. If this is a VA proposal, you must still receive a letter of approval from the Research and Development Committee prior to beginning the research project. If this is a MVH proposal, you must still receive a letter of approval from the Human Investigation and Research Committee (HIRC) prior to beginning the research project. This implies the following:

1. That this approval is for one year from the approval date shown on the Action Form and if it extends beyond this period a request for an extension is required. (Also see expiration date on the Action Form)
2. That a progress report must be submitted before an extension of the approved one-year period can be granted.
3. That any change in the protocol must be approved by the IRB; otherwise approval is terminated.

If you have any questions concerning the condition(s), please contact me at 775-4462.

Thank you!  
Enclosure



RESEARCH INVOLVING HUMAN SUBJECTS

SC# 6153

ACTION OF THE WRIGHT STATE  
UNIVERSITY  
EXPEDITED REVIEW  
Assurance Number: FWA00002427

Title: *'High-Stakes Decision-Making for Crisis Leadership'*

Principal Investigator: Terry Oroszi, M.S., Research Instructor  
Department: Pharmacology & Toxicology

Expedited Category: 7

The Institutional Review Board has approved the use of human subjects on this proposed project with conditions previously noted. The conditions have now been removed.

REMINDER: FDA regulations require prompt reporting to the IRB of any changes in research activity, changes in approved research during the approval period may not be initiated without IRB review (submission of an amendment), and prompt reporting of any unanticipated problems (adverse events).

  
Signed \_\_\_\_\_ Coordinator, WSU-IRB

Expedited Review Date: March 11, 2016

IRB Meeting Date: April 18, 2016

**This approval is effective only through: March 11, 2017**  
To continue the activities approved under this protocol you should receive the appropriate form(s) from Research and Sponsored Programs (RSP) two to three months prior to the required due date. If you do not receive this notification, please contact RSP at 775-2425.

**APPENDIX D**

**IRB PETITION**

Petition for Approval of Social, Educational and Behavioral Research Involving Human Subjects  
(Excludes Research involving Protected Health Information)

Wright State University Office of Research and Sponsored Programs

Date:

For RSP use only

Title of Research Project:

Requested Review Assignment (**NOTE:** Research and Sponsored Programs will determine the actual review designation. Therefore, you may be required to provide additional copies)

Expedited Review [see <http://www.hhs.gov/ohrp/policy/expedited98.html>]

Exempt Research [see <http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html#46.101>]\*

\*you must provide the appropriate citation for this exemption request:

**PRINCIPAL INVESTIGATOR INFORMATION:**

Principal Investigator	Academic Title	Phone
<input type="text" value="Terry Oroszi"/>	<input type="text" value="Research Instructor"/>	<input type="text" value="9377754832"/>

Department	Fax
<input type="text" value="Pharmacology &amp; Toxicology"/>	<input type="text" value="9377757221"/>

Address	E-mail
<input type="text" value="217 Health Sciences, 3640 Colonel Glenn Hwy. Fairborn, OH 45435"/>	<input type="text" value="Terry.oroszi@wright.edu"/>

Contact person to receive study correspondence. Include name & phone no.	Contact E-mail
Terry Oroszi	Terry.oroszi@wright.edu

Position (check one):

Faculty:  Student/Resident:  Staff  Other (specify):

1. Indicate the names of other investigators participating in the research. If a student is listed as principal investigator, specify a faculty advisor. Indicate academic titles, if any, for all investigators.


(WSU only) Check here to indicate that Principal Investigators/Advisor (exempt protocols) or all investigators/advisor (expedited and full board) have completed the required human subjects protection training offered by Collaborative Institutional Training Initiative (CITI) through Wright State University—see <http://www.citiprogram.org/> and IRB Policy P.5. (found in the IRB Charter at [http://www.wright.edu/rsp/IRB/irb\\_charter.html](http://www.wright.edu/rsp/IRB/irb_charter.html)).

(Other institutions) Check here to indicate that Principal Investigators/Advisor (exempt protocols) or all investigators/advisor (expedited and full board) have completed the required human subjects protection training offered by Collaborative Institutional Training Initiative (CITI) through another institution. Please attach a copy of the CITI report for each investigator listed on the study.

List the names of all other investigators and key study personnel who will be involved in the conduct of this research. For every name include each person’s academic/professional title and their proposed role in the study. If study-related healthcare decisions are to be made and the PI does not have a license to practice medicine in Ohio, a qualified clinician must be listed.


2. FUNDING INFORMATION:

Indicate the category of the sponsor (if applicable):

Industry (other than pharmaceutical)     State Government     Local Government  
 Pharmaceutical Company     Non-Profit Organization     Federal Agency

- Internal Grant Program  
 No Funding

Other (specify)

Provide the name(s) of any and all sponsors of this research checked above:

### 3. FINANCIAL INTEREST DISCLOSURE:

- a. Does the PI or his/her spouse or dependent children have an ownership interest (stock or equity) in the sponsor of this study or have they received direct compensation (not through WSU or Premier Health) from the sponsor in the past 12 months?

Yes       No

If yes, please provide the name and contact information for the individual who has the financial interest:

- b. Do any of the study investigators or key study personnel (including all spouses and dependent children) listed above have an ownership interest (stock or equity) in the sponsor of this study or have received direct compensation (payment not through WSU or Premier Health) from the sponsor in the past 12 months?

Yes       No

If yes, please provide the name and contact information for the individual who has the financial interest:

- c. Do the PI, study investigators or any key study personnel (including their spouses and dependent children) have any financial interests that are related or could appear to be related to the drug, device, technology, equipment or software tested or utilized in this study?

Yes       No

If yes, please provide the name and contact information for the individual who has the financial interest:

- d. Does this study involve intellectual property that is owned by the University, the PI or other WSU faculty or staff members?

Yes       No

If yes, please provide the name and contact information for the individual who has the financial interest:

#### 4. PROTOCOL INFORMATION

Attach a concise description summarizing the following areas (specifically address the subject's role in the research). [Note: Submit a MAXIMUM of 4 double-spaced pages; descriptions exceeding this limitation will be returned for re-writing.]

- Purpose of research
- Background and hypothesis
- Procedures
- Risks
- Potential benefits
- Inclusion and exclusion criteria
- For all DHHS studies, a copy of the DHHS-approved sample consent document and the complete DHHS protocol must be submitted.

In addition, provide (1) copy of all documents to be given to subjects during the research.

#### 5. Indicate all that apply to the research:

- Review of educational records\*
- In-person interview\*\*
- Self-administered questionnaire\*\*
- Telephone interview
- Review of public dataset without identifiers\*\*\*
- Laboratory Study (briefly describe)
- Other (describe)

\*Note: For record reviews, copies of the data collection instruments must be provided.

\*\*Copies (see instructions for number) of any interview, surveys, or questionnaires must be submitted along with documentation that permission has been obtained to use any copyrighted materials in your research.

Please check here to indicate that appropriate permission has been obtained. \*\*\*For public datasets without identifiers, a copy of the data review form must be provided.

#### 5. RISK ASSESSMENT:

5. Does the study involve any risk to the subjects? Examples of risks/discomforts include: dizziness, nausea, embarrassment, social stigma (shame or disgrace), psychological distress, loss of employment, invasion of privacy and breach of confidentiality.  Yes  No

If yes:

- a. Indicate where these risks are described in the protocol and consent form/cover letter.
- b. Are the risks/discomforts reasonable in relation to anticipated benefits (if any)?   
Yes  No
- c. IF the answer to (b) above is “yes”, please explain why the research should be performed.

6. When applicable, will medical or psychological resources be made available to participants after their completion of the study, if the research produces consequences in which these services are required?  Yes  No  N/A. If yes:

- If yes, indicate where the description may be located within the protocol:
- If yes, and If not described in the protocol, attach an explanation of resources.  
Explanation attached?  Yes  No

#### CONFIDENTIALITY AND PRIVACY:

Any data which contains subject identifiers, or which can be linked to a subject identifier, must be kept confidential. In addition, the subject’s privacy during the study (e.g. during the consent process or during study procedures) must also be respected as is appropriate based on the nature of the research. Please answer the following questions:

7. Will any information collected during this study contain information that can identify the subject? This includes signed consent documents and study documents.

Yes  No

- a. If yes, please indicate which of the following will contain subject identifiers such as name, address, social security number, phone number, etc. Check all that apply to the study:

Consent Document

Study Data with subject identifiers

Study data without subject identifiers, but which can be linked via a unique code to the subject identity

Other (please describe):

- b. If the answer to 7 (above) is yes, please describe the specific steps that will be taken to insure that the signed consent document(s) and/or study data will remain confidential. This includes where the data will be stored, and how access will be restricted to only those authorized to review it. The consent sheets will have names of the subjects filling out the questionnaire, when the questionnaires are returned they will be done via email but the document itself will not have a name.

Please note:

- a. For student researchers, all study data containing subject identifiers may not be stored on student computers or at a non-WSU campus/hospital location.
  - b. In general, any data containing personal/identifying information should not be stored on thumb drives, portable computers or personal computers.
  - c. Hospitals have specific requirements for data storage. Consult with the hospital research office for specific requirements
  - d. If any identifiable study data containing protected health information will be transmitted electronically, describe how the data will be encrypted, password protected, and sent only through secure channels. The need to perform electronic transmission of protected health information must be justified in the study protocol.
8. Please indicate how subject privacy will be respected during the study (check all that apply):

All study procedures will be performed by the subjects at a time and place of their choosing (e.g. the study is a survey that is being performed online on the subject's personal computer)

Consent will be obtained from subjects in a private location

Consent will be obtained from subjects in a group session, however, a method will be provided to allow subjects to decline participation without embarrassment or (if possible) without the knowledge of the other participants

Study procedures will be performed in private (as appropriate)

Study procedures will be performed in a group session, however subjects should experience minimal concerns about privacy due to the nature of this research.

Study subjects will be instructed to respect the confidentiality of any responses provided by other study subjects (e.g. for focus groups or interviews involving multiple subjects)

Other (please describe):

9. Have adequate safeguards been taken to protect against identifying, directly or indirectly, any individual subject in any report of the research project?  Yes  No If No, provide further information.

10. Will a Certificate of Confidentiality be requested from NIH?  Yes  No

- If yes, does the Consent Form advise the subjects of situations where the PI may voluntarily comply with state laws?  Yes  No
- If yes, has the standard confidentiality statement been modified to be consistent with Confidentiality Certificate protections? See <http://grants.nih.gov/grants/policy/coc/index.htm>.  Yes  No

#### STUDY SITE RESOURCES:

11. Is this study a multi-center study, with multiple PIs, for which the PI at WSU is the lead investigator or WSU is the coordinating site of the study?  Yes  No

If yes, are there procedures in place for the PI or WSU to adequately manage the protection of human subjects (such as Adverse Events (AEs), modifications and progress reports) at all the research sites?  Yes  No. If no, please explain

12. You may either answer the following questions or attach a separate page (check here if a separate page is attached)

- a. State where you will be conducting the research study (e.g. Wright State University (WSU), Veterans Administration (VA), Good Samaritan Hospital (GSH), Miami Valley Hospital (MVH), etc.)  
Include the address for any site not affiliated with WSU



WSU  DCOP  VA  GSH  MVH  Atrium  Other

- Name of site(s):
- If other than WSU, Dayton Clinical Oncology Program (DCOP) or hospital facility, describe the facility where the study will be conducted 
  - Please check here to indicate that permission has been received to perform research at non-WSU sites (documentation must be submitted)

b. Are any personnel other than the PI (or PI and Faculty Advisor for student research) involved in this research?  Yes  No

If yes, how will the PI ensure that all research staff for the study are adequately informed of the research-related duties and functions?

c. If previously collected de-identified data is being used in the research (for example, publicly available datasets), briefly describe the source (leave blank if non-applicable)

d. Are there adequate resources to complete the research study?  Yes  No

e. Is there access to a population that will allow recruitment of the required number of participants?  
 Yes  No If no, explain how subjects will be recruited in item 17., below.

#### RECRUITMENT:

13. Will this research study recruit any subjects from the following “Vulnerable” categories? Check all that apply.

- Cognitively Impaired
- Minors (<18 years of age)
- Pregnant women
- Prisoners
- Others vulnerable to coercion (e.g. employee of research site or sponsor, students of investigator). Describe:

14. Describe the population from which the researcher will recruit (or data source from which data will be obtained): A questionnaire will be sent via email (see attached) to people in crisis high-stakes decision-making. They will identify which of the 50 traits they use, do not use, or unsure. They will return via email. Phone interviews will be conducted to answer questions.  
 Note: if subjects are being recruited at a non-WSU site (e.g. local schools, prisons etc.) provide a copy of the permission to use that site signed by an institutional official, or, equivalently, approval from their IRB.

15. How will participants be recruited for this study? Attach copies of any materials given to prospective subjects and/or scripts of any oral communication used to recruit subjects.

Participants will be recruited by word of mouth or express invitation. The researcher has >200 global contacts in this field. To include Military, Government, and Non-Government Organizations (NGOs).

16. What type of advertising will be used for this study? Check all that apply.  
 Note: If an advertisement is to be used, WSU policy requires prior written approval from the PI's department chair and dean. A copy of the advertisement with approval of the chair or dean must be submitted with this application for IRB review.

No advertising will be used

- Newspaper       Poster       Brochure       Web Site  
 Recruitment Letter       Internet       E-mail       Radio or TV (script)  
 Other (describe)

17. State the approximate expected number and age range of participants to be enrolled. List each group, arm, cohort, etc. if applicable, including control groups, on separate lines. If only one group, description would be "All." Check "N/A" if the only data used in the study will come from a previously existing, de-identified data source. N/A  (Note: This applies to exempt studies only)

Group	NUMBER OF SUBJECTS		AGE RANGE OF SUBJECTS	
	All sites for which you are the PI	All other sites	All sites for which you are the PI	All other sites
One	10-50		25-70 yrs	


- a. Are subjects who might otherwise benefit from the research excluded from participation?  
 Yes  No. If yes, provide scientific and ethical reasons for excluding these subjects  
.
- b. Is the subject population representative of the population base from which subjects could be selected with respect to *gender* representation  
 Yes  No. If no, please explain. .
- c. Is the subject population representative of the population base from which subjects could be selected with respect to *minority* representation).  
 Yes  No. If no, please explain. .

18. Will subjects be paid or otherwise compensated?  Yes  No  N/A. If yes:

- a. What is the amount of the compensation?
- b. If not monetary, what will be used for compensation?
- c. What is the reason for compensation?
- d. If subjects are to be remunerated, indicate how this remuneration will be prorated over the course of their participation.

19. Are there anticipated costs to study participants?  Yes  No  N/A. If yes, describe and justify the costs:

**INFORMED CONSENT:**

20. Is the short form process for obtaining consent going to be used in the study (if the short form for consent will be used, the complete process that will be followed for obtaining short form consent must be described and attached. See WSU Standard Operating Procedures, Policy 12 – Obtaining Informed Consent in Human Subjects Research at [www.wright.edu/rsp/subjects.html](http://www.wright.edu/rsp/subjects.html)).  Yes  No

21. Is deception being used in the study (which prevents the full purpose of the study from being disclosed in the consent document)?  Yes  No

If *Yes*, then a waiver of informed consent must be requested (by responding to question 24).

22. Will there be a consent document used in this study? (A consent document is usually a signed consent form, but may also be a cover letter, or an introduction to a survey).  Yes  No  
If *No*, a waiver of informed consent must be requested (by responding to Question 24).

- a. If yes, will the consent document be signed?  Yes  No If *No*, then a waiver of informed consent documentation must be requested (see question 25).
- b. If the consent document is going to be signed, who will be signing? (Indicate all that may apply):

- Participant (adult)  
 Participant (minor, signing an assent) with parent or guardian signing permission  
 Legally authorized representative (LAR) for participant

Note: Legally authorized representatives should provide consent only when the research subject is unable to provide consent for him or herself. If a LAR will be signing in lieu of the participant, please provide an explanation of (1) why this will be necessary for this research and (2) how the authority of the LAR will be verified.

23. For unsigned consent documents (e.g. when the consent information is found in a cover letter or a survey introduction) please indicate the rationale for waiving the documentation of informed consent by checking the appropriate box below. Also, please be sure that you have included a rationale for using an unsigned consent document in your research protocol. The waiver of documentation can only be approved if it meets one of the following two categories:

The only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality.

or

The research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

24. If the consent document will not include all the required elements of informed consent (Refer to <http://www.wright.edu/rsp/IRB/NewProtocolReviewChecklist.doc>) (which is the case if deception\* is being used in the study) then a waiver of consent must be requested by answering the following questions. A waiver can be granted only if the answer to all of the following questions is “Yes”.

- a. The research involves no more than minimal risk to the participants.  Yes  No
- b. The waiver or alteration will not adversely affect the rights and welfare of the participants.  Yes  No
- c. The research could not practicably be carried out without the waiver or alteration.  Yes  No
- d. The research is not subject to FDA regulation.  Yes  No
- e. That for any person for whom consent has not been obtained, *whenever appropriate*, additional pertinent information will be provided after participation.  Yes  No  N/A

\*If deception is used, the subjects MUST be debriefed after participation. Please include a copy of the debrief script.

25. Informed consent involves more than obtaining the subject’s signature on a consent form. It is a process between the investigator and the subject that involves sharing information and addressing questions and concerns to allow the subject to fully understand what they are agreeing to. For complicated protocols, or for subjects with limited comprehension, it is often appropriate to include an assessment of comprehension as part of the consent process. [NOTE: The Informed Consent Form should be written in 8<sup>th</sup> grade language. For Subjects who cannot comprehend English, the Informed Consent Form must be provided in the Subject’s native language, via a certified translation with back-translation.]

Please describe the process by which informed consent will be obtained and documented by answering the following questions. *This section does not need to be completed if a waiver of informed consent has been requested and informed consent will not be sought from study participants.*

- a. The consent interview (the opportunity for the subject to discuss the protocol with the investigator or designee) will be conducted by:  
 Study staff     Investigator or co-investigator     Other (describe)

N/A (e.g. if the consent process does not involve any contact between the investigator and the subject)

b. Will subjects have an opportunity to ask questions prior to signing the consent document?

Yes  No  N/A

c. Will comprehension be assessed in some fashion (e.g. through use of a verbal or written assessment test)? Note: This is not required for all protocols, but is appropriate for very complicated protocols, or for protocols involving subjects with limited comprehension.

Yes  No  N/A

If yes, please briefly describe how comprehension will be assessed:

d. Will participants be allowed to review the consent document at home prior to signing?  Yes  No  N/A

e. Is there a waiting period between the consent discussion and the signing of the consent document?

Yes  No  N/A

f. Are there procedures in place to minimize the possibility of coercion or undue influence?

Yes  No. If No, please explain:

g. If consent will be obtained from adults who are cognitively impaired on a temporary basis at the beginning of the research, is there an opportunity (if appropriate) for these participants to provide consent after recovery of cognitive function?

Yes  No  N/A

h. Will a copy of the informed consent document be provided to the participant? If no, please provide a justification.

Yes  No Justification if "No" **\*\* Cover letter used, not consent letter**

### SIGNATURES AND CERTIFICATIONS

By signing and submitting this application, the Principal Investigator agrees that he/she:

1. Accepts responsibility for the scientific conduct of the project, that the scientific portion of the protocol is original and contains no false, fictitious, or fraudulent statements or data. Signature certifies that all listed investigators have reviewed the proposal and that the research will be conducted in full compliance with WSU policies and federal regulations.
2. Has provided the IRB with all the information on the research project necessary for its complete review.
3. Will submit progress reports to the IRB for review in a timely manner in order to obtain appropriate continuing review to maintain the approval status of the protocol.
4. Will submit all changes in the study to the IRB for review and approval before implementing those changes.
5. Will submit anticipated problems (including adverse events) to the IRB for review in a timely manner.
6. Will not put this research project into effect until final IRB approval is received.
7. Has completed the required modules in the CITI training program, which can be found at <http://www.citiprogram.org/> (see also IRB Policy P.5.)
8. Has completed the electronic Significant Financial Interest Disclosure form (for researchers with Wright State University affiliation (e.g. faculty appointment))

*Jerry Oswaj*

\_\_\_\_\_  
Signature of Principal Investigator                      Date

All other Investigators and/or Faculty Advisor listed on the cover of this petition (if any) must sign to acknowledge their participation in this project:

\_\_\_\_\_  
Signature of Faculty Advisor                                      Date

\_\_\_\_\_  
Signature of Co-Investigator                                      Date

\_\_\_\_\_  
Signature of Co-Investigator                                      Date

\_\_\_\_\_  
Signature of Co-Investigator                                      Date

\_\_\_\_\_  
Signature of Co-Investigator                                      Date

Purpose of research – To develop a high-stakes/crisis decision-making model for global leaders in the fields of in first response, active threat, chemical, biological, radiological, and nuclear (CBRN) defense, and medical emergency. The model can be used for other complex problems and debriefing.

Local subject matter experts in the fields of first response, active threat, chemical, biological, radiological, and nuclear (CBRN) defense, and medical emergency are working together to form a Dayton (Ohio) Think Tank and this research will determine a decision-making model for said group.

Background and hypothesis – Seven decision-making models were deconstructed to become a 50 traits questionnaire. The traits were listed in alphabetical order with a Y, N, or U as choices. The questionnaire will be given to several high-stakes decision-makers from around the world. These experts will identify those attributes they use in their decision-making practice, traits they do not use. The questionnaire includes an additional third option labeled as undecided.

Through the use of the questionnaire, interviews, and Q-sort analysis the working hypothesis that a new crisis decision-making model is needed will be explored. The current Naturalistic Model may be appropriate for some crisis decision-making, but not all. The new model created will represent the most valuable traits and validated by a team of experts. This model may be applied to other complex decision-making.

The goal of the model includes gathering valuable input from all of the decision-makers at the table, so the decision-making is more informed while representing the whole team. This model can aid not only in defining a process of decision-making but also facilitate debriefing to determine what worked in a situation, and what went wrong.



Research by leading experts suggests two categories of decision-making processes, Rational, and Intuitive. Rational models are the most employed models. This model category is considered logical and involves a series of steps to work through the decision-making. They are often based on assumptions as well as facts.

Rational decision-making models contain decision matrix analysis, Pugh matrix, SWOT analysis, Pareto analysis and decision trees. Decision matrix grids (Cervone, 2009) are more complex examples of decision-making models where the various options are rated against the significant criteria in the decision. For this research the Rational decision-making model category will be represented by the Rational Model (Simon, 1977), Political Model (Pfeffer, 1981; Turpin & Marais, 2006), and the Multi-Attribute Utility Analysis (G. A. Klein & Calderwood, 1996) decision tree. One common fault of the Rational Models is their ability to be time-consuming and often require a lot of groundwork involving information gathering. In high-stakes decision-making, the time for extensive groundwork may be impossible, but the knowledge gathered imperative to find the best solution.

The Intuitive models do not depend on reason or logic but on intuition and experience. Intuition based decision-making techniques, part of the second of the two major categories, can improve decision outcomes. For this research the Nominal Group (J. Horton, 1980; M. Horton, Rogers, Austin, & McCormick, 1991) and the Delphi (Cantrill, Sibbald, & Buetow, 1996) technique traits will be included in the questionnaire.

Several models are combinations of the Rational and Intuitive categories. The Naturalistic decision-making Model is an example of a blending of the two categories and closely represents how crisis decisions are made (Klein, G., & Klinger, D., 1991; G. A. Klein & Calderwood, 1996).

#### Procedure –

1. An email will be sent to the potential participants. This email will include the cover letter introducing the subjects to the research and have the 50 traits questionnaire attached.
2. Once completed the subjects will return the questionnaire.
3. The information will be entered once all of the questionnaires have been returned.

More information on procedure - Identifying traits of classical decision-making models is the first step in this process. Next will be to create a questionnaire with the identified traits. The questionnaire will be given to several high-stakes decision-makers from around the world. These experts will identify those attributes they use in their decision-making practice, traits they do not use. The questionnaire will include an additional third option labeled as undecided. The high-stakes decision-making traits questionnaire will be returned and a Q-sort (short for quick sort) analysis will be performed on the results. Q-sort will sort the answers and couple “like responses” by the contributors, as well as performing a nearest neighbor analysis, identifying response relationships with other traits.

Interviews by phone, email, or face-to-face as needed will fill any potential gaps in the traits questionnaire. An interview will verify the strengths and weakness of the proposed model and confirm the experts understood the questionnaire.

Risks -No Risks identified

Potential benefits - Through the use of the questionnaire, interviews, and Q-sort analysis the working hypothesis that a new crisis decision-making model is needed will be explored. The current Naturalistic Model may be appropriate for some crisis decision-making, but not all. The new model created will represent the most valuable traits and validated by a team of experts. This model may be applied to other complex decision-making. The goal of the model includes gathering valuable input from all of the decision-makers at the table, so the decision-making is more

informed while representing the whole team. This model can aid not only in defining a process of decision-making but also facilitate debriefing to determine what worked in a situation, and what went wrong.

Inclusion and exclusion criteria - The sample panel of experts will include experts in first response, active threat, chemical, biological, radiological, and nuclear (CBRN) defense, and medical emergency. They will be high-risk decision-makers from four continents, government and civilian sectors.

**APPENDIX E**  
**CURRICULUM VITAE**

Email: terry.oroszi@wright.edu Phone: 937.212.4576 Fax: 937.775.7221

---

**Contact - Work Address:**

Boonshoft School of Medicine, WSU  
Pharmacology & Toxicology Dept.  
3640 Colonel Glenn Hwy.  
Dayton, OH 45435

**Contact - Home Address:**

109 North Main St. Ste. 1206  
Dayton, OH 45402

**Educational Background:**

**Post-Doctoral Fellowship, VA Medical Center** (May 2015 – May 2016) Advanced Clinical Simulations/Medical Education. A one-year interprofessional fellowship working under the mentorship of Dr. Rosalyn Scott and Dr. Nephthalim Greene at the Dayton VA Medical Center. The program offers advanced training in simulation teaching, curriculum design, educational program implementation, study design and research.

**Doctorate of Education** (August 2013 – April 2016) Organizational Studies, Leadership/Concentration: Business, Wright State University.

**Dissertation Topic:** “*A Preliminary Analysis of High-Stakes Decision-Making for Crisis Leadership*” With the help of global, national and local high level leaders, a shared crisis decision-making analysis identified top traits used in decision-making that will aid the novice crisis leader.

**Additional Research Project:** “4-5-6 Power Platform” A power “game” workshop that identifies an individual’s personal power, and how to use it to achieve their goals.

**Additional Research Project:** Creation of a new group decision-making model for small organizational groups and an IRB approved behavior assessment tool. This is a study of human behaviors, in particular the struggle for power in groups.

**Master of Business Administration** (Fall 2013 - present): Raj Soin College of Business/  
Concentration: Marketing, Wright State University.

**Masters of Science** (Spring 2002): Biological Sciences/Concentration: Molecular Genetics, Department of Biological Sciences, Wright State University, Dayton, Ohio.

**Research:** Identification and Characterization of Short Repeated DNA Sequences in Artiodactyl and Insectivore Genomes. Advisor: Dan E. Krane.

**Bachelor's of Science** (June 1998): Biological Sciences/Concentration: Evolutionary Biology, Department of Biological Sciences, Wright State University, Dayton, Ohio.

**Undergraduate research** (1997-1998): Department of Biological Sciences, Wright State University. Advisor: Jim Amon. The Relationship between Rhizopus and Plant Roots.

**Undergraduate teaching assistant** (1997): Department of Biological Sciences, Wright State University. Advisor: Dan E. Krane. Molecular Biology Laboratory.

### **Work Experience, Administrative:**

#### **Pharmacology & Toxicology Graduate Program Director: (May 2008 – Present)**

2008 - Interim Director of the Master of Science graduate program; the program was generating 250k in revenue, paid 29% of faculty salaries, and recruited an average of five

students a year. By the end of 2014 the program was generating 1.5 million a year, handled 50 - 100% of salaries and accepted 28 students into the program.

Other key annual accomplishments include:

2009 - Presented a non-thesis MS option, due to this change enrollment doubled in one year.

2010 - Introduced/developed, several courses into the thesis/non-thesis tracks, including a CBRN course with the goal of a 3 course certificate program, a series of clinical courses taught by practicing surgeons, recruited a National Public Radio science correspondent adjunct faculty. Two of the courses start our distance learning curriculum.

2011 - Transferred the MS program from quarter to a semester system.

2012 - CBRN Defense Certificate program approved. While preparing for the semester conversion a financial risk to the university (25% loss of revenue) was identified and reported, with the conversion and reported this to the university financial VP. This 25% reported loss across the university was confirmed.

2013 - Introduced a new MS program for WSU, Emergency Management Disaster Preparedness. Co-chaired an FBI/WMD (Weapons of Mass Destruction) Symposium. Degrees awarded increased from 8 in fall 2009 to 31 in fall 2013, representing an increase of 288%. Course credit hours taught increased from 579 in fall 2009 to 1,112 in fall 2013, representing an increase of 92 %.

2014 – Rebranding of the Non-Thesis degree to a Leader/Admin degree, added several classes (Six Sigma, GLP..). This option is now more popular than the research option. Creation of three online foundation courses. The CBRN certificate program is now online to accommodate distance learners.

2015 – New MS program tutor center, an MD/MS track, CBRN program expansion, and an MS degree online option.

**Co-chair, EMDP MS Advisory Board: (2014 - Present)** I initiated the EMDP MS degree, completed research of all graduate EM and equiviliant programs in the US, and identified gaps in the education, worked on the business plan (ROI 700% with a very conservative budget model), completed the Program Development Plan, added in recruitment of advisory board members (2 faculty from each school at WSU). Start date for EMDP program is fall 2016.

**Director, Chemical, Biological, Radiological, Nuclear Defense (CBRN) Certificate Program: (November 2012 – Present)** Department of Pharmacology & Toxicology, Boonshoft School of Medicine. Average ten students per year complete this program. As director and instructor of this online certificate program, I continue to recruit Battelle and WPAFB expert faculty. We also have webinars, tours, and other unique offerings. Expansion to national level funded by the BSOM.

**Director, Pharmacology Genetic Testing Facility Boonshoft School of Medicine:** (July 2006 – 2011) Act as liaison for all correspondence between the Laboratory Animal Research Facility and the Department of Pharmacology and Toxicology. This included monitoring of fiscal issues with Laboratory Animal Research Facility. Regular meetings with Laboratory Animal Research to discuss inspections and other issues about our department. Monitored all Animal Use Protocols, amendments, and continuing reviews submitted by the Department to and from Research and Sponsored Programs and submitting such documents for some faculty in the department. Also meetings on behalf of Faculty, Laboratory Animal Research Facility, Research and Sponsored Programs, and the Department of Pharmacology concerning sensitive matters, to include controlled substance uses and inspection failures.

**Assistant Director, STREAMS Program:** (Short-Term Training Program to Increase Diversity in Health-Related Research) (February 07- September 09)  
Pharmacology/Toxicology Department, School of Medicine, Wright State University. STREAMS was the recipient of the 2010 Kim Goldenberg quest for community award.

**Assistant Director, Pharmacology & Toxicology Graduate Program** (July 2005 – June 2006) Duties included but not limited to recruitment, marketing, web and brochure

design, displays, attend conferences and recruitment. Liaise periodically students and faculty: Performed initial phone and personal interviews with potential students, aid them in the application process, and invite them to interview if they qualify, respond to requests, inquiries. Schedule meetings, appointments and classroom space, coordinate travel arrangements email announcements, changes, and updates to enrolled students, perform basic statistics on student information (past, present, and future), update and maintain files, mailing lists, databases (Microsoft Office applications), find funding and advisors for new students, looking for scholarships and lastly establishing and maintaining online courses offered by our program.

**C.L.A.S.S.** (Spring 2001-2003): (Creating Laboratory Access for Science Students) NSF funded program that promotes excellence in the science education of students with disabilities. Systemic reform in the area focuses on training educators at all levels. The project is grounded in universal design; inquiry-based laboratory and field experiences. Roles included: Instructor for summer CLASS workshops; Attend and oral presentations at National Conferences where laboratories designed by me were presented, and local conference Quest, to bring awareness of the CLASS program to the community of our commitment to diversity issues as well as offer opportunities to students and educators, and to exchange resources related to diversity enhancement; CLASS Liaison: Survey museums, parks, and zoos in Ohio and surrounding areas to meet with directors, report on accessibility of establishments, create a key for educators planning field trips, and aid the establishments in improving their and accessibility for people with a variety of disabilities. Visit schools, churches, and groups to educate on accessibility issues. Assist in writing inquiry-based laboratory manuals, preparation of laboratories to accommodate students with disabilities, and other committee duties.

### **Work Experience, Preclinical Research:**

**Laboratory Manager/ Research Associate:** (February 07 – January 2013) My duties included manage new and current students, visiting scholars, etc. in the lab, order equipment, reagents, lab supplies as well as troubleshooting the equipment. To increase



productivity, I created, followed and instructed others in Standard Operating Procedures of the lab. Research of current publications for up to date methods and work related to cardiovascular and diabetes research, and the monitoring of funding agencies for available funding and assist with grant writing were imperative. The position required extensive use of Microsoft software, Adobe software, Primer design, and statistical packages as well as knowledge of computer hardware, hardware replacement, software, and networking.

Experience with rodents, handling, dissecting, some surgical procedures, drug injections and post-op care were essential parts of the research aspects, as were Genotyping, Primer Design, Mass spec, DNA extraction, PCR, Real Time PCR, Northern Blotting (and other molecular techniques, and animal husbandry for genetically modified rodents. Providing technical assistance in performing laboratory experiments, designing all experiments and writing the Animal Use Protocols, Amendments, Continuing Reviews, reviewed and approved by LACUC committee were key duties in this role, as well as the creation and maintenance of a database for animal inventory and use for department and university use.

**Research Assistant:** (July 2003 – February 2007) Pharmacology/Toxicology Department, School of Medicine, Wright State University. Designed and maintains an Access database specialized for mice. Created multiple forms, spreadsheets, and templates for the laboratory and department use for requesting mice, Real Time PCR, diluting primers, conversions (moles, grams, M1V1/M2V2) Write Animal Use Protocols (for LUCAC committee approval, and D.O.D.) for breeding, and mice used for a variety of experiments, inc. specialized husbandry, cross-strains, and multi-surgeries. Perform procedures such as decapitations, sutures, and removal of organs, and glands. Maintained all LAR breeding, protocol & surgery rooms. Managed monthly reports on all costs associated with departmental AUPs, grants, primary investigators, relating to the use of mice. Work with other PIs to set up breeding colonies and experimental designs.

### Work Experience, Teaching:

**Pharmacology and Toxicology Instructor: (July 2010 – present)** Responsible for teaching the following courses. The list below includes teaching after semester conversion only.

<b>Year</b>	<b>Course</b>	<b>Title</b>
Fall 2015	PTX8000 (3.0 CR)	Human Studies Research
Fall 2015	PTX8120 (3.0 CR)	Case Studies for Chemical Biological Radiological Defense
Fall 2015	PTX8210 (3.0 CR)	Applications to Medical Biological Defense, Principles of Toxicology
Fall 2015	PTX9000 (3.0 CR)	Introduction to Research
Fall 2015	PTX9200 (3.0 CR)	Pharmacology Clinical Research
Fall 2015	PTX9200 (1.0 CR)	Pharmacology Clinical Research
Fall 2015	PTX9220 (3.0 CR)	Effective Scientific Writing: Part 2
Summer 2015	PTX 8000 (2.0 CR)	Advanced Science Writing
Summer 2015	PTX 8200 B-01 (3.0 CR)	Communications in Science
Summer 2015	PTX 9120 (3.0 CR)	Eff. Sci. Writing Part 1
Summer 2015	PTX 9120 (3.0 CR)	Eff. Sci. Writing Part 2
Summer 2015	PTX 8000 (3.0 CH)	Human Studies Research
Summer 2015	PTX 8120 (3.0 CH)	Case Studies for Chemical Biological Radiological Defense
Spring 2015	PTX-9120-01 (3.0 CR)	Scientific Writing 1
Spring 2015	PTX-8210-01 (3.0 CR)	Med. Bio. Defense
Fall 2014	PTX 9000-01 (3.0 CR)	Intro to Pharmacology Research
Summer 2014	PTX 8000 B-01 (1.0 CR)	Independent Study
Summer 2014	PTX 8000 B-02 (2.0 CR)	Independent Study
Summer 2014	PTX 8000 C-03 (3.0 CR)	Career development advising
Summer 2014	PTX 8120 B-01 (3.0 CR)	Case Studies CBRN Defense

Summer 2014	PTX 8200 B-01 (3.0 CR)	Communications in Science
Summer 2014	PTX 9120 01 (3.0 CR)	Eff. Sci. Writing Part 1
Summer 2014	PTX 9120 01 (3.0 CR)	Eff. Sci. Writing Part 2
Fall 2013	PTX 8000 02 (2.0 CH)	Selected Topics - Pharmacology
Fall 2013	PTX 9000-01 (3.0 CR)	Intro to Pharmacology Research
Summer 2013	PTX 8000 (3.0 CR)	Selected Topics - Pharmacology
Summer 2013	PTX 8120 B-01 (3.0 CR)	Case Studies CBRN Defense
Summer 2013	PTX 8200 B-01 (3.0 CR)	Communications in Science
Spring 2013	PTX 9220-01 (3.0 CR)	Intro to Library Research pt. 2
Fall 2012	PTX 7110-02 (1.0 CH)	Journal Club
Fall 2012	PTX9000-01 (3.0 CR)	Intro to Research
Fall 2012	PTX 9120-01 (3.0 CH)	Intro to Library Research pt. 1
Summer 2012	PTX 772 B01 (3.0 CH)	Case Studies CBRN Defense
Summer 2012	PTX 772 B01 (4.0 CH)	Case Studies CBRN Defense
Summer 2012	PHA 701 C03 (3.0 CR)	Communications in Science
Summer 2012	PTX 990 B04 (1.0 CR)	Laboratory Safety
Summer 2012	PHA 899 C01(3.0 CR)	Science writing Select topics
Spring 2012	PTX 745 01 (3.0 CH)	Intro to Library Research pt.2

**Wright State University, College of Science and Math, Biology Dept: (2000 - 2003)**

<b>Year</b>	<b>Course</b>	<b>Title</b>
Spring 2003	BIO 107	Intro to Human Diseases
Summer 2003	BIO 345	Intro to Biological Concepts (Lecture)
Spring 2003	BIO 107	Intro to Human Diseases (Lecture)
Fall 2002	BIO 345	Intro to Biological Concepts (Lecture)
Winter 2002	(Laboratory)	Intro to Biological Concepts – Biodiversity
Fall 2002	(Laboratory)	Intro to Biological Concepts – Food
Fall 2000	(Laboratory)	Comparative Vertebrate

Summer 2000	(Laboratory)	Intro to Biology – Disease
-------------	--------------	----------------------------

### **Graduate Training:**

**Research Assistant** (2001-2002): Department of Biological Sciences, Wright State University. Advisor: Michele Wheatly. (Based on mini-grant (not listed) submission by Terry Oroszi) NSF funded grant to survey local museums, parks, zoos, and planetariums to inspect accessibility for people with disabilities, programs for people with disabilities, educational resources for teachers, educational programs for teachers and students, websites.

**Graduate Research Associate** (1998-2000): Department of Biological Sciences, Wright State University. Advisor: Dan E. Krane. Molecular methods applied in the collection of data coupled with computer-driven analysis to identify short interspersed nucleotide sequences in mammals. This combination of molecular techniques and various computer platforms allowed for the clarification of the molecular evolution of mammals based repetitive DNA elements.

**Graduate Teaching Assistant** (1998-2000): Department of Biological Sciences, Wright State University. Advisor: Dan E. Krane. Molecular Biology Laboratory, Plant and Animal Laboratory, Ecology laboratory, and Comparative Vertebrate Laboratory. Molecular Biology Recitation and Cell Recitation.

### **Computer Skills:**

**Platforms:** Macintosh, Windows, Linux, WebCT/PILOT (distance learning)

**Bioinformatics:** Gen Bank, Medline, and Pubmed

Database search for homologous sequences (BLAST search)

Dot Plots (DottyPlot)

Multiple Alignment of related sequences (Clustal W)

Phylogenetic reconstruction (PAUP, Phylip, and McClade)

**Word Processing:** Microsoft Office

**Data Analysis:** Excel, Cricket Graph, SPSS, S-Plus statistics software, PRISM

**Graphic design:** Adobe CS6 including InDesign, Acrobat, Illustrator, Photoshop, Elements, Dreamweaver, some Flash and Sound booth experience. Microsoft Publisher,

**Other:** Idrisi Geographic Information System, Microsoft Access and Powerpoint

### **Additional Training:**

**Primary BLS Instructor:**(Veterans Health Administration/American Heart Association (FL20779))

**Talent Management System VAMC Course:** High-Fidelity Simulation

**Talent Management System VAMC Course:** The Voice of Leadership: Leadership Message

**Talent Management System VAMC Course:** The Voice of Leadership: Inspirational Leadership

**Talent Management System VAMC Course:** The Voice of Leadership: Effective Leadership Communication Strategies

**Talent Management System VAMC Course:** Diabetes: mechanisms and complications (programs: 63612 & 310712)

### **Grants:**

CBRN Defense Program Expansion (2015) Boonshoft School of Medicine finances expansion start up costs to make the CBRN program a national program. (24,000 loan)

(MAY 2009) NHLBI National Heart, Lung, and Blood Institute administrative supplement to provide summer research experiences for students or science educators (Notice NOT-OD-09-060). NHLBI provided up to 45K to support a science educator for 2 yrs. This was a supplement grant, to Dr. Mariana Morris's NIH grant. (\$45,000)

Oroszi, T.L., (2001) Taking C.L.A.S.S. Outdoors, and Into The Community. C.L.A.S.S., Wright State University, Dayton, Ohio, 45435. Funding Agency - Michele Wheatly - National Science Foundation (\$9,792)

Oroszi, T.L., Krane, D.E. (2000) Characterization Of Putative Spider Monkey Subspecies Within The Population At Curu Biological Preserve In Costa Rica. Department of Biological Sciences, Wright State University, Dayton, Ohio, 45435. Co-Funded Wright State University College Of Science And Math, And The Department Of Biological Sciences.

Oroszi, T.L., Krane, D.E. Barnett, D. (2000) Identification Of A Chromosome Defect In Howler Monkey In Costa Rica. Department of Biological Sciences, Wright State University, Dayton, Ohio, 45435. Co-Funded Wright State University College of Science and Math, and The Department of Biological Sciences.

### **Book Chapters/Papers/Abstracts:**

Scott, R., Dominguez, M., Burgess, D., **Oroszi, T.**, Gallimore, J., (2016). Implementing provider, patient: Provider and patient facing interventions in a virtual environment, The MedBiquitous Annual Conference, Johns Hopkins School of Medicine in Baltimore, MD.

James, L. and **Oroszi, T.** (2015) Is your neighbor a terrorist? Praeger Publishing, Santa Barbara, CA (Book in Preparation)

- Oroszi, T.** and James, L. (Eds.), (2015). *Technology is the new WMD*, Praeger, Santa Barbara, CA (Book in Preparation)
- Mari, M. MD, Younes, S., Simman, R., **Oroszi, T.**, Alsabri, Chen, Y., Cool, D., (2015). The Correlation Between Wound Healing Rate and Circulating Microvesicles Collected from Stage III and IV Pressure Wounds Fluid Treated with NPWT Alone VS NPWT and Oasis Ultra. *Society of Thoracic Surgeons, STS 52nd Annual Meeting*.
- Scott, R. P., Gallimore, J., Burke, B., Benton, N., Carabello, H., Davidson, M., Ingmundson, P., McCoy, S., Graham, C., **Oroszi, T.**, Dominguez, M., (2015). The VA Virtual Medical Center: Implementing a Vision for a Virtual Healthcare Campus for our Veterans, In *Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC)*.
- Mari, M. MD, Younes, S., Alsabri, S.G., Shaban, A., Simman, R., Chen, Y., Cool, D.R., **Oroszi, T.**, (2015). The Correlation Between Wound Healing Rate and Circulating Microvesicles Collected from Stage III and IV Pressure Wounds Fluid Treated with NPWT Alone VS NPWT and Oasis Ultra. *The Amputation Prevention Symposium, Chicago, IL*.
- Oroszi, T.**, (2015). Disruptive technology; Don't get caught with your pants down. Technical Symposium Cincinnati-Dayton Chapter of INFORMS.
- James, L. & **Oroszi, T.**, (Eds.), (2015). *Weapons Of Mass Psychological Destruction And The People That Use Them*, Praeger, Santa Barbara, CA Praeger Publishing, 2015
- James, L. & **Oroszi, T.**, (2015). Introduction. In *Weapons of Mass Psychological Destruction and the People That Use Them* (pp. 3-6). Praeger Publishing Praeger Publishing, 2015 James, L. & **Oroszi, T.**, (2015). Defining Weapons of Mass Psychological Destruction. In *Weapons of Mass Psychological Destruction and the People That Use Them* (pp. 8-22). Praeger Publishing, 2015

- Holman, M., James, L. & **Oroszi, T.**, (2015). Who Becomes a Terrorist. In *Weapons of Mass Psychological Destruction and the People That Use Them* (pp. 23-41). Praeger Publishing, 2015
- James, L. & **Oroszi, T.**, (2015) Emerging Trends in the Prevention of Management of WMPD. In *Weapons of Mass Psychological Destruction and the People That Use Them* (pp. 312-322). Praeger Publishing, 2015
- Oroszi, T.** (2015). Traditional Faculty Meeting Style is not Conducive to Group Decision Making. Manuscript accepted for Midwest Academy of Management Conference Oct, 2015.
- Oroszi, T.** (2015). Egos at the Table, a Study of Meeting Behaviors. Manuscript accepted for Midwest Academy of Management Conference Oct, 2015.
- Senador, D., Key, M., **Oroszi, T.**, Elased, K. M., & Morris, M. (2009). Role of circulating and renal RAS in blood pressure maintenance in ACE overexpressing mice. Paper presented at the Hypertension, 54(4) E68-E68.
- Senador, D., **Oroszi, T.**, Key, M., Elased, K. M., & Morris, M. (2007). Angiotensinergic control of blood pressure in mice overexpressing ACE. Paper presented at the Hypertension, 50(4) E143-E143.
- Chen, Y., **Oroszi, T.**, & Morris, M. (2006). Salt consumption increases blood pressure and abolishes the light/dark rhythm in angiotensin AT1a receptor-deficient mice. *Physiology & Behavior*, 88(1), 95-100.
- Oroszi, T.L.** (2003). Innovations in Universal Activities for Geoscience Education. Geoscience Innovation Fostering the Achievement of All Students. Curriculum and Pedagogy Methods Reform, Universal Design Principles, and Applications, Seattle, WA, GSA Annual Meeting.
- Oroszi, T. L.** (2002). Paleontological concepts for all students: Physical, not visual, inquiry-based activities for engaging students in science. Paper presented at the 2002 Denver Annual Meeting, GSA



Brame, R., **Oroszi, T.**, Wood, T. Kirch, S. Lunsford, S. (2002). Inventions For Inquiry-Based Teaching In Geosciences For ALL Students: Accessible, Inviting, And Intellectually Developing.

### **Oral Presentations:**

**Oroszi, T.**, (April 27, 2016). Mindset of a Terrorist. Centerville Public Library, Centerville OH. 2 hour lecture.

**Oroszi, T.**, (March , 2016). Power: Perspective, Platforms, and Paradigms., (Introducing my 4-5-6 Power Platform) WSU's Power and Leadership Staff Development Day., Wright State University, Beavercreek, OH. (2 sessions, AM and PM)

**Oroszi, T.**, (February 11, 2016). Invited guest on behalf of the United States, United Nations Conference on Human Rights of Victims of Terrorism, United Nations Headquarters, New York.

**Oroszi, T.**, (February, 2016). Keynote speaker, Defense Institute Study and Education (IDSE) Military Supply Chain Workshop. Wright State Foundation, Wright State University, Beavercreek, OH.

**Oroszi, T.**, (February, 2016). Friends of the Library Lecture Series, Weapons of Mass Psychological Destruction (>100 attendees) Wright State University, Beavercreek, OH.

**Oroszi, T.**, (February, 2016). Americans' Participation in Islamic Extremism. 4 Hour workshop, Advanced Technical Intelligence Center (ATIC), Beavercreek, OH.

**Oroszi, T.**, (2015). Americans' Participation in Islamic Extremism. 8 Hour workshop, Advanced Technical Intelligence Center (ATIC), Beavercreek, OH.

**Oroszi, T.**, (2015). A new model for collaborative decision making. VA Simulations Center, VAMC Dayton, OH.

- Oroszi, T.**, (2015). 4-5-6 Power Platform. Midwest Academy of Management Doctoral Consortium. Columbus, OH.
- Oroszi, T.**, (2015). The use of power in organizations. Qualifying Defense, CEHS, WSU, Fairborn, OH.
- Oroszi, T.**, (2004) Beyond Video Games-Promoting Active Learning for All Students A selection of science activities designed for the participation of ALL students is solicited. Available technologies/equipment that encourage active learning from students with disabilities will be discussed. GSA. Denver CO Annual Meeting.
- Oroszi, T.L.**, (2003). Genotyping Mice. Pharmacology/Toxicology Department, School of Medicine, Wright State University.
- Oroszi, T.L.**, (2003). Tools of the Trade. Geological Society of America, Seattle WA.
- Oroszi, T.L.**, (2002). Physical, not visual, Fossil Identification for all Students: Practical Paleontological Concepts for Fossil Identification. Geological Society of America, Denver CO.
- Oroszi, T.L.**, (2000) Identification and Characterization Of Short Repeated DNA Sequences In Artiodactyl and Insectivore Genomes. Spring Sing, Wright State University Department of Biological Sciences Department.
- Oroszi, T.L.**, (1999). Evolution and Function Of Highly Repeated Short Sequences In The Artiodactyl Genome. Cincinnati Zoo, Cincinnati OH.
- Oroszi, T.L.**, (1999). Evolution and Function Of Highly Repeated Short Sequences In The Artiodactyl Genome. Biological Sciences Molecular Retreat Dayton Biotechnology Group. Engineers Club, Dayton, OH.
- Oroszi, T.L.**, (1999) D.N.A. Profiling. Guest Seminar for STREAMS mentor program. Wright State University.

## Media

<http://fox45now.com/news/fighting-back> also on <http://abc22now.com/news/fighting-back/guantanamo-transfers-could-end-up-in-the-us>

[http://muscatinejournal.com/news/local/muscatine/muscatine-native-examines-the-psychological-impact-of-terrorist-attacks/article\\_c56d8042-ebbc-57ab-b601-27fa5752d71f.html](http://muscatinejournal.com/news/local/muscatine/muscatine-native-examines-the-psychological-impact-of-terrorist-attacks/article_c56d8042-ebbc-57ab-b601-27fa5752d71f.html)

<http://www.mydaytondailynews.com/news/news/local-military/biggest-impact-of-terrorist-attacks-fear/np7x8/>

<http://webapp2.wright.edu/web1/newsroom/2016/01/11/wright-state-experts-publish-book-on-weapons-of-mass-psychological-destruction/>

<https://webapp2.wright.edu/web1/newsroom/2015/08/14/cbrn-defense-certificate-program-offers-all-courses-online-each-semester/>

<https://webapp2.wright.edu/web1/newsroom/2014/06/30/boonshoft-school-of-medicine-offers-new-m-s-degree-in-leadershipadministration-in-pharmacology-and-toxicology/>

<http://webapp2.wright.edu/web1/newsroom/2013/01/24/wright-state-university-department-of-pharmacology-toxicology-implements-a-new-certificate-program-in-chemical-biological-radiological-nuclear-defense-cbrnd/>

## Acknowledgements:

**Terry Oroszi**, who conducted the AT1 genotypes. Article: Khalid M. Elased, David R. Cool, and Mariana Morris Novel Mass Spectrometric Methods for Evaluation of Plasma Angiotensin Converting Enzyme 1 and Renin Activity *Hypertension* 46: 953-959, 2005.

**Terry Oroszi** Article: Anthony B. Polito III, David L. Goldstein, Lylian Sanchez, David R. Cool, Mariana Morris, Urinary oxytocin as a non-invasive biomarker for

neurohypophyseal hormone secretion, *Peptides*, Volume 27, Issue 11, November 2006, Pages 2877-2884.

**Terry Oroszi** for language revision. Article: G. V. Rodovalho, C. R. Franci, M. Morris, J. A. Anselmo-Franci, Locus Coeruleus Lesions Decrease Oxytocin and Vasopressin Release Induced by Hemorrhage *Neurochemical Research*, Volume 31.2 259 – 266, 2006-02-07.

**Terry Oroszi**, Director of Pharmacology Genetic Testing Laboratory, for providing the gene deletion mice. Article: Rogerio B. Wichi, Vera Farah, Yanfang Chen, Maria Claudia Irigoyen, and Mariana Morris Deficiency in angiotensin AT1a receptors prevents diabetes-induced hypertension *Am J Physiol Regul Integr Comp Physiol* 292: R1184-R1189, 2007.

We thank **Terry Oroszi**. Article: Vera Farah, Khalid M. Elased, and Mariana Morris Genetic and dietary interactions: role of angiotensin AT1a receptors in response to a high-fructose diet *Am J Physiol Heart Circ Physiol* 293: H1083-H1089, 2007.

We would like to gratefully acknowledge the help of **Terry Oroszi**. Article: Khalid M. Elased, Tatiana Sousa Cunha, Fernanda Klein Marcondes, Mariana Morris, Brain angiotensin-converting enzymes: role of angiotensin-converting enzyme 2 in processing angiotensin II in mice, *Experimental Physiology*, 93.5 (665-675) 2008.

**Mentored/Advisor for the following Pharmacology & Toxicology**

**Graduate Students 2013 - 2015:** (Previous Years not listed)

<b>2015: Name</b>	<b>2014: Name</b>	<b>2013: Name</b>
Alabdrabalnabi, Eman	Alsagri, Ahmed	Al Acrouk Samera
Andijani, Yusra	Farag Mosa	Elhshik, Elham
Khan, Aiman	Abdulmagid Sherif	Elzergani Khaled
Momenah, Tahani	Sara Younes	Embirsh Maison
Subedi, Sachchida	Manar Hajjan	Karabinis Alexandros

Almutairi, Fahdah	Nnaemeka Obianagha	Mohamed Fatma
Chinnapareddy, Srinivasula	Nagasudheer Balusu	Mohsen Ramzi
Egbai, Paulet	Siham Abdulla	Dukali Ibrahim
Greene, Matthew	Jawaher Aldurayhim	Booth, Heather
Ihezurike, Nedu	Bala Karri	Taylor, Tara
Karri, Bala	Daniel Baker	Aburagaya, Amira
Kassem, Sara	Saud Thabet	Emtebakh, Basher
Kumbaji, Meenasri	Yetunde Fajulugbe	Hagezy, Ahmed
Law, Rebecca	Yousef Aljohani	Nasrat, Taofik
Law, Sarah	Hassan Alhejaili	Almiahuob, Mohamad
Motharapu, Rajitha	Bader Althuwaini	Zwaitt, Mohamad
Sen, Ebru	Cathy Graham	Nabil Murghum
Sharma, Shriya		Jacob Heitzman
Sheela, Suhasini		Samia Mohamed
Tabal, Najib		Nomula, Mounika
Timmisetty, Muralikrishna		Amruta Pradhan
Tosun, Amanda		Brenda Owuor
Younes, Marwa		Cierra Bell
Zhang, Cheng		Hala Alsheikh
		Hector Nava
		Joshua Buck
		Muna Osman
		Nusieba Ibrahim
		Majdi Abdulmaula

**Awards / Honors:**

Michelle Obama Role Model of Excellence Award (2010)

Phi Beta Delta International Honors Society. (2000)

College of Science and Mathematics Award for Outstanding Teaching. (1999)

**Professional Societies/services:**

Executive Director, Simman Wound Board

President, Men's Health Board

Institute for Operations Research and Management (INFORMS)

Midwest Academy of Management (MAM)

The Association for Medical Education in Europe (AMEE)

American Council on Education (ACE)

Phi Beta Delta International Honor Society